Giishpin Nonagzwaat Binoojiinyik Kanim Na Majiishkaami:

Determinants of Obesity Among Indigenous Children

in Six First Nations Communities in Northeastern Ontario

by

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Abstract

Background: Worldwide, childhood obesity rates are high and even higher among Indigenous children. Childhood obesity is of concern as it can result in metabolic conditions. Much has been written about the causes of obesity, usually focusing on individual behaviours, but a gap exists in understanding the social determinants of obesity in Indigenous populations.

Methods: Survey data was collected from First Nations students in grades 6 to 8 through a diet and health behavior survey. Measurements including height, weight and waist circumference were taken. Focus groups with 33 caregivers were conducted to explore the determinants of physical activity and nutrition.

Results: The prevalence of overweight/obesity in children was 65.8%. The prevalence central obesity was 37.7%. There was a strong positive correlation between waist circumference (cm) and BMI z scores ($r_s = 0.84$, $p>0$). Daily physical activity (DPA) of 60 minutes per day was associated with a BMI $\leq 85^{th}$ percentile and a waist circumference $\leq 90^{th}$ percentile. Girls consumed 3.5 servings of fruits and vegetables and boys consumed 2.5 servings. Consuming fruit juice was directly associated with central obesity. Normal weight was associated with participation in at least four types of cultural activities.

Caregivers identified impediments to physical activity as financial, recreational technology, safety concerns, and community activation. Changes in lifestyles, influenced by the consequences of colonization, have resulted in reduced physical activity. Colonial policies result in funding challenges for children's recreation programs and a reliance on government develops. Safety concerns stem from intergenerational trauma created by colonial policies.

Dietary decisions were influenced by the availability of fish and game, hunting and fishing regulations, food insecurity and the proliferation of processed foods. Dietary decisions

are influenced by the contamination of traditional territories, the marginalization of culture, participation in the economy and issues of poverty.

Conclusions: Waist circumference is an effective indicator of obesity along with BMI and should be used in public health screening of Indigenous children. Low fruit and vegetable consumption is of concern as is the consumption of fruit juice. Protective factors against obesity are 60 minutes of DPA and participation in at least four types of cultural activities. Colonialism is a determinant of physical activity, nutrition, and obesity in this population.

Keywords: Indigenous, First Nations, children, obesity, BMI, waist circumference, physical activity, nutrition, colonialism, focus groups

Co-Authorship Statement

This thesis is presented in an integrated-article format as per the policy in the School of Rural and Northern Health Student and Supervisor Program Handbook (updated on 14-December-2017). Three papers are included in this thesis and each paper includes co-authorship by members of my PhD committee. As the principal investigator and first author on all three papers, I was responsible for the content of each paper. I was also primarily responsible for writing the initial draft manuscript and editing the final version after each co-author provided feedback and contributions. All the co-authors contributed in significant ways, including (1) the design of the study; (2) the analysis, synthesis, and interpretation of data; (3) the content of each paper; and (4) the editing drafts and revisions requested by journals. All three papers are included in the body of the thesis (Chapters 3, 4, and 5) and two have been submitted for publication in academic peer-reviewed journals. Chapter 4 was submitted to the *Rural and Remote Health Journal* on March 9, 2018. Chapter 5 was submitted to the *International Journal of Indigenous Health* on February 16, 2018.

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CHAPTER 1

1.0 Introduction & Review of Literature

Indigenous children are one of the most vulnerable populations in Canada. Health disparities experienced by Indigenous children include: heavier birth weight, high infant mortality, low immunization rates, frequent respiratory tract infections, high rates of ear infections and tooth decay, high FASD rates, high teen fertility rates and high suicide rates (Smylie & Adomako, 2009; UNICEF Canada, 2009). Attention to the difficult conditions faced by Indigenous peoples in Canada has surfaced numerous times over the years. For example, the *Hawthorn Report* in 1966 recognized the social, economic and education inequities facing First Nations people. In 1993, the Ontario government released the report titled *For Generations to Come: The Time is Now a Strategy for Aboriginal Family Healing* which describes the health challenges faced by Indigenous peoples in Ontario and was the foundation for Ontario's Aboriginal Healing and Wellness Strategy (Aboriginal Family Health Joint Steering Committee, 1993). The Royal Commission on Aboriginal Peoples (RCAP) documented five years of consultations and research that provides details of many of the historical traumas that have impacted Indigenous peoples' health in Canada (Canada Royal Commission on Aboriginal Peoples, Dussault, & Erasmus, 1996). More recently, the Truth and Reconciliation Commission (TRC) documented the intergenerational impacts of Indian Residential Schools and issued 94 Calls to Action, seven of which deal with health (Truth and Reconciliation Commission of Canada, 2015). Specifically, number 18 states that:

> We call upon the federal, provincial, territorial, and Aboriginal governments to acknowledge that the current state of Aboriginal health in Canada is a direct result of

> previous Canadian government policies, including residential schools, and to recognize and implement the health-care rights of Aboriginal people as identified in international law, constitutional law, and under the Treaties. (p. 322).

The RCAP and TRC reports explicitly link the health disparities experienced by Indigenous peoples with colonization and systematic oppression by the Canadian government.

Research has been used as a form of oppression. For too many years, Indigenous peoples have had research imposed upon them by outside researchers with little or no benefits to their communities (Brant Castellano, 2004; Smith, 1999). Ensuring that Indigenous people have a voice in health research was the approach taken during this thesis research. This research was informed by a community engagement process that was conducted between July and December 2010 in order to identify health issues affecting First Nations children and youth on Manitoulin Island in northeastern Ontario. Elders, health professionals, educators and youth workers shared their concerns about the health and well-being of children during thirteen community engagement sessions. Many of their concerns were about obesity and related conditions such as diabetes, heart disease, and hypertension. There were also concerns about the emotional impacts of obesity such as negative body image, unhealthy eating behaviours, and self-medicating with food (McGregor, 2011). With the guidance of a Steering Committee comprised of community representatives, this study was developed.

The purpose of this study was to estimate the rate of obesity among First Nations children in six First Nation communities and determine if obesity was associated with fruit and vegetable consumption, sweet beverage consumption, physical activity, screen time, sleep and cultural activities. I also wanted to explore perceptions about physical activity and nutrition held by caregivers in the same six communities. This was done through a ‘two-eyed seeing’ approach

using a mixed methods design. The results provide a better understanding of obesity, nutrition, and physical activity among First Nations children of school age who live on-reserve in the Manitoulin Island region of northeastern Ontario.

Anishinaabe culture was an important consideration in this study. Culture has been defined by Willows as: "…the values, beliefs, attitudes and practices accepted by members of a group or community" (2005, S33). Dumont (2006) has described important aspects of Anishinaabe culture including the Creation story, spirituality, wholeness, connection to earth, relationships and a worldview that influences ways of thinking, being, seeing and relating. Indeed, First Nations youth have identified family values (58%), traditional ceremonial activities (40%), Elders (39%), First Nations language (29%) and social connections (29%) as sources of community strength (First Nations Information Governance Centre, 2012). Knowledge of language and culture strengthen identity and connection to the natural world and are important aspects of Indigenous health and well-being (Chandler & Lalonde, 1998; Kirmayer, Dandeneau, Marshall, Phillips, & Williamson, 2011; UNICEF Canada, 2009).

This thesis takes the form of a series of three academic articles, situated between introductory, methods and discussion chapters. This first chapter reviews the relevant literature on childhood obesity and health behaviours associated with obesity. Chapter Two describes the research approach, the theoretical framework and the methods used to gather data in the six First Nation communities. The results of my original research are presented in three chapters which include: the rates of obesity and relationship to health behaviours among Indigenous children are presented in Chapter Three, followed by the perceptions of caregivers on physical activity (Chapter Four) and the perceptions of caregivers on nutrition (Chapter Five). Finally, a discussion of these findings within the broader literature is presented in Chapter Six.

1.1 Terminology

Numerous terms have been used to refer to the original peoples of North America. The legal definition in the Canadian *Constitution* defines Aboriginal peoples as including three groups: Indian, Inuit and Métis. The term 'Indian' is not only a misnomer but is considered offensive and has been rejected as a state-created identity that is intended to perpetuate colonialism (Alfred & Corntassel, 2005; National Aboriginal Health Organization, n.d.).

The term *Indigenous* will be used in this thesis as it has been accepted internationally (International Labour Organization, 1989; United Nations General Assembly, 2007) and is currently the least offensive term (Vowel, 2016). Indigenous peoples have also begun to reclaim their identity with their own names. For example, the Indigenous people in this study population are primarily *Anishinaabe*. *Anishinaabe* refers to a language and cultural group that has been referred to as Ojibway, Ojibwe, Chippewa or Algonquin but also includes Odawa and Potawatomi. The term *First Nations* will be used if the literature is specifically referring to Indigenous peoples who are neither Métis nor Inuit. In the 1980's, Indigenous people rejected the term 'Indian reserve' and began referring to their communities as a First Nation. First Nation is also referred to as 'on-reserve' in some of the literature (National Aboriginal Health Organization, n.d.).

Part of the title of this thesis is in the Anishinaabe language which I asked my parents, Murray and Marion McGregor, to translate for me. *Giishpin Nonagzwaat Binoojiinyik Kanim Na Majiishkaami* loosely translated means 'Healthy Children = Healthy Futures'.

1.2 Literature Review

This literature review provides a definition of obesity and ways of assessing obesity in children. The rates of obesity among Indigenous children in Canada are presented as well as some of the health behaviours that influence obesity.

Importance of Obesity

Obesity puts children at risk for health problems such as: "…breathing difficulties, increased risk of fractures, hypertension, early markers of cardiovascular disease, insulin resistance and psychological effects" (World Health Organization, 2018). The psychological effects of obesity can be just as troubling as physical health effects and include poor self-esteem, depression, and eating disorders (Shapiro, 2009). Childhood obesity can also have an impact on health status into adulthood (Halfon, Larson, & Russ, 2010) putting people at greater risk for developing, "cardiovascular disease, insulin resistance, musculoskeletal disorders, some cancers and disability" (World Health Organization, 2017b). Clearly, weight problems experienced during childhood and the teen years can establish a negative health trajectory into adulthood. Indigenous peoples already experience greater health disparities so understanding the determinants of obesity in Indigenous children is important to reducing health disparities.

Definition of Obesity and Methods for Assessing Obesity

According to Flegal and Ogden (2010) there are different terms to describe weight and adiposity but they write, "Strictly speaking obesity refers to excess body fatness and overweight to weight in excess of a weight standard" (p.3). Definitions of obesity by the World Health Organization (WHO) and the World Obesity Federation (WOF) make the link between excessive fat accumulation and the impairment of health (World Health Organization, 2017a; World Obesity Federation, 2015). Identifying obesity in children and youth is complicated because of

variance in growth patterns (Lau et al., 2007). Although there are different ways to assess body weight and excess body fat, the most commonly used ones for children are the Body Mass Index and waist circumference.

Body Mass Index. Body Mass Index (BMI) is recognized internationally as a measure of weight for height, calculated as weight in kilograms divided by the square of height in meters (Flegal & Ogden, 2010). Age and gender specific percentile charts have been developed for children because of variability in growth patterns and differences between males and females that takes into account height, sex, and age relative to a reference population (Flegal & Ogden, 2010). The World Health Organization Growth Reference 2007 for children 5-19 years uses data collected by the American Centre for Health Statistics between 1963-1974 and is recommended for use in Canada (Dietitians of Canada, Canadian Paediatric Society, The College of Family Physicians of Canada, & Community Health Nurses of Canada, 2010). These growth reference charts provide the following ranges for overweight and obesity in children:

Overweight: >85th centile for BMI-for-age and –sex

Obese: >97th centile for BMI-for-age and –sex

Severe obesity: >99.9th centile BMI-for-age and –sex

BMI is an inexpensive method to screen for potential health problems at a population level but it is not a diagnostic tool for obesity (Flegal & Ogden, 2010). The main problem with BMI is that it is not only correlated with percentage body fat but also with muscle and lean mass so it is not a precise measure of fat (Flegal & Ogden, 2010).

A comparison of fat distribution between First Nation peoples and Canadians of European descent showed that the prevalence of obesity as determined by BMI and waist circumference was higher among First Nation peoples (Katzmarzyk & Malina, 1998).

Indigenous children have also been found to have a higher prevalence of obesity and central adiposity than their Caucasian peers (Anderson et al., 2010). Despite this tendency towards higher BMI and central obesity among Indigenous adults and children, the health risks are no different than other populations with similar BMI and central obesity thus using the current thresholds for BMI and waist circumference is appropriate for Indigenous people (Lear, Humphries, Frohlich, & Birmingham, 2007).

Waist circumference and central adiposity. Waist circumference is an indirect measure of central adiposity. Central adiposity is of concern among children because it is associated with morbidities like hypertension, dyslipidemia, insulin sensitivity, and metabolic syndrome (Fernández, Redden, Pietrobelli, & Allison, 2004; Goran & Gower, 1999; Kaler et al., 2006; Ng, Marshall, & Willows, 2006; Sharma, Metzger, Daymont, Hadjiyannakis, & Rodd, 2015; Taylor, Jones, Williams, & Goulding, 2000; Zimmet et al., 2007) and can set a trajectory for ill health into and throughout adulthood. Increasing rates of abdominal obesity have been attributed to increased caloric intake, bigger portion sizes, sweetened beverages, and declines in vigorous physical activity (Li, Ford, Mokdad, & Cook, 2006).

The gold standards for measuring central obesity are computed tomography (CT) and magnetic resonance imaging (MRI) but the high cost and exposure to radiation (CT) make these two diagnostic tests unsuitable for children (Taylor et al., 2000). Waist circumference measurements have been compared with CT to assess abdominal obesity with reasonable validity (Gradmark et al., 2010). Dual-energy x-ray absorptiometry (DEXA) has been shown to be an effective measure of central obesity and has been used with children (Taylor et al, 2000) and with Indigenous adults (Lear et al., 2007). Although DEXA cannot distinguish between subcutaneous fat and visceral fat it has been correlated with central obesity and waist

circumference (Brambilla et al., 2006; Taylor et al., 2000). Waist circumference is an inexpensive and indirect measure of central obesity which can be done easily in a clinical setting. Although there is variability in the anatomic sites of measurement, the relationship between abdominal obesity and metabolic risks have been found to be similar (Harrington, Staiano, Broyles, Gupta, & Katzmarzyk, 2013). Waist circumference may be a better indicator of health risks than BMI (Kaler et al., 2006; Pigford, Sanou, Ball, Fehderau, & Willows, 2011; Sharma et al., 2015) and is used by the International Diabetes Federation as a measure of obesity when defining metabolic syndrome in children and adolescents rather than BMI (Zimmet et al., 2007).

Waist circumference percentile values are used with children rather than absolute numbers in order to adjust for growth patterns and gender differences. Most studies on children have compared waist circumference data with percentiles developed by Fernandez and colleagues (2004) who used data from the third National Health and Nutrition Examination Survey (NHANES III - 1988-1994) in the US. They found differences in waist circumference among African-American, European-American, and Mexican-American children, and developed ethnic specific percentiles for these three groups. Waist circumference percentiles for Canadian children and youth have been developed using data from the 1981 Canada Fitness Survey (P. T. Katzmarzyk, 2004). Sharma and colleagues (2015) developed waist-circumference percentile charts using the NHANES III data. Although more recent waist circumference data has been produced in later cycles of NHANES, older reference data was used in order to create percentiles that would reflect waist circumference before the current obesity epidemic (Sharma et al., 2015).

Waist circumference percentiles describe a population rather than prescribe what waist circumference should be among children and adolescents (Fernández et al., 2004) as there is no consensus on a clinical threshold for central obesity (P. T. Katzmarzyk, 2004; Lear et al., 2007;

Li et al., 2006; Sharma et al., 2015). The International Diabetes Federation suggests using waist circumference ≥90th percentile, or the adult cut-off points if lower than the 90th percentile, for children aged 10 to 16 as one of five clinical characteristics of metabolic syndrome (Zimmet et al., 2007). Adult cut-off points for abdominal obesity are based on gender and vary among some ethnicities due to differences in body composition (Zimmet et al., 2007). The cut-off point for women ranges from ≥80 to ≥88 centimetres and the cut-off point for men ranges from ≥90 cm to ≥102 centimetres (Alberti, Zimmet & Shaw, 2006).

The reference data compiled by Fernanadez et al (2004) are frequently referred to in the literature and ≥90th percentile is the most commonly used cut-off point for children. Waist circumferences in children above the 90th percentile have been associated with increased metabolic risks (Kaler et al., 2006; Maffeis, Pietrobelli, Grezzani, Provera, & Tatò, 2001; Wahi, Zorzi, Macnab, & Panagiotopoulos, 2009; Zorzi, Wahi, Macnab, & Panagiotopoulos, 2009). Studies that have reported on measured waist circumference in First Nations children in Canada include:

- Kaler et al., 2006 – The BRAID study (Believing we can Reduce the Aboriginal Incidence of Diabetes) is an ongoing diabetes screening project in one rural northern Alberta Cree First Nation community. Results indicate that the waist circumference of 65.5% of children and adolescents exceeded the 90th percentile, using age and gender centiles from Fernandez et al, 2004. Waist circumference was found to be the primary predictor of metabolic syndrome, and was responsible for 65.5% of the variance in metabolic syndrome. This study included 84 children between the ages of 6 and 18 years.
- Downs, Marshall, Ng, and Willows, 2008 – A study called ‘The Active Kids Project’ in two remote Cree communities in Northern Quebec found that 52.2% had a waist

circumference ≥85th percentile using the NHANES III reference data. Those with central obesity were less physically active (fewer pedometer steps and shorter run time in the shuttle run). Waist circumference was also positively correlated with sweetened beverage intake. This study included 178 children aged 9 to 12.

- Zorzi et al., 2009 – A study on metabolic syndrome in three remote First Nations in northern British Columbia found that 35.9% of the participants were centrally obese as defined by ≥90th percentile when compared to the Fernandez et al, 2004 charts. This study included 192 children aged 6 and 18 years.
- Anderson et al., 2010 – This Saskatchewan study compared 212 Indigenous children to 204 Caucasian children between the ages of 8 and 17. Dual-energy x-ray absorptiometry (DEXA) and waist circumference were used to measure adiposity. This study applied the ≥85th percentile from NHANES III as a measure of central obesity and considered three maturity categories: pre-peak height velocity, peak height velocity and post-peak height velocity. Central obesity in Indigenous girls ranged from 25.6% to 36.8% whereas central obesity in Caucasian girls ranged from 4.2% to 7.1%. Central obesity in Indigenous boys ranged from 15.5% to 36.8% whereas central obesity in Caucasian boys ranged from 0% to 4.2%. The authors suggest that there may be a tendency for Indigenous children to accumulate adipose tissue in the central region in addition to the normal adiposity changes that occur during puberty.
- Pigford et al., 2011 - A study in a rural Cree Albertan community found that 49.5% of the 105 children between the ages of 5 and 12 had waist circumference ≥85th percentiles when compared to the NHANES III data. The study found that abdominal obesity in children was associated with not meeting daily step recommendations.

The high rates of central obesity among Indigenous children are of concern because they put this population at risk for metabolic complications.

Rates of overweight and obesity

The prevalence of overweight and obesity among children around the world has been steadily increasing. According to the World Health Organization, the rates of overweight and obesity increased from 32 million in 1990 to 41 million in 2016 (World Health Organization, 2017b). The majority of overweight children are in developing countries however the rates among children are of concern. In Canada, between 1978/79 and 2004 the prevalence of overweight and obesity among adolescents aged 12-17 increased from 15% to 26% (Shields, 2006). By 2011, the prevalence of overweight/obesity among adolescents had increased to 26.9% (Statistics Canada, 2016a). In the 6 to 11 age group, the rates of overweight and obesity decreased from 36.1% in 2004 to 25.8% in 2012/2013 (Rao, Kropac, Do, Roberts & Jayaraman, 2016). In the 12 to 17 age group, the rates of overweight and obesity increased from 32.6% in 2004 to 36.8% in 2012/2013 (Rao et al, 2016).

The prevalence of overweight and obesity among Indigenous children is much higher than the general population in Canada. A national survey of First Nations children conducted in 2008/2010 found that the rate of overweight and obesity was 62.5% among children between the ages of 3-11 (based on parent-report) and 42.7% among youth between the ages of 12-17 years (self-reported) (First Nations Information Governance Centre, 2012). Parents tend to under-report height among younger children (ages 2 – 11) resulting in overestimation of overweight (Akinbami & Ogden, 2009). Conversely, adolescents tend to underestimate their weight, females more so than males and overweight individuals more so than non-overweight individuals (Sherry, Jefferds, & Grummer-Strawn, 2007) thus, "measured height and weight remains the

gold standard for surveillance" (Akinbami & Ogden, 2009, p. 1574). Regional studies of First Nations children, whose height and weight were measured by researchers, found high rates of overweight and obesity ranging from 27% to 73% (Hanley et al., 2000; Ng et al., 2006; Noreen D. Willows, Ridley, Raine, & Maximova, 2013; Zorzi et al., 2009).

Etiology of Obesity in Individuals

At the individual level, overweight and obesity are caused by an imbalance of energy intake and output, however genetics and physiology play important roles in regulating body weight. Obesity is a heritable trait with 40-70% of twins in adoption studies having a Body Mass Index (BMI) that correlated with their biological parents (Miller, Rosenbloom, & Silverstein, 2004). Mutations in genes, such as the *ob* gene which encodes the hormone leptin, account for 5-10% of morbid obesity (Friedman, 2009). Many different organs, biological systems and hormones are involved in the regulation of body composition. The organs involved in metabolism include: adipose tissue, muscles, stomach, pancreas, brain, and the gastrointestinal tract. Leptin, a hormone that is produced by adipose tissue, helps regulate food intake and energy expenditure. Ghrelin, another hormone, is produced in the stomach and also regulates the metabolism. Metabolites such as glucose, amino acids and fatty acids also help regulate the metabolism (Friedman, 2009). These organs, hormones and metabolites comprise a complex biological system described by Friedman (2009) who states the following:

> Food intake and body weight are controlled by an intercalculated feedback loop. Signals from numerous tissues that together form the short- and long-term systems – including adipose tissue and the gut – travel to integratory brain centres, where they are decoded. The neural pathways then control food intake and metabolism in several peripheral tissues. …Several behavioural, genetic and metabolic signals regulate feeding through

> signals that travel from distinct peripheral tissues to integratory centres in the brain. After processing these signals, the brain modifies feeding and also sends appropriate commands to specific peripheral tissues to regulate metabolism (p. 341-342).

The complex interplay of these systems within the body regulates body composition. In addition to the genetic and physiological causes of obesity, gestational diabetes, prenatal malnutrition, and parental adiposity have been found to be associated with childhood obesity (Rosenbaum & Leibel, 1998). Given the high rates of these conditions among the adult Indigenous population, it is not surprising that the prevalence of obesity among Indigenous children and youth is higher than the general population (Millar & Dean, 2012; Oster, King, Morrish, Mayan, & Toth, 2014; T. K. Young, Reading, Elias, & O'Neil, 2000). Reducing obesity among Indigenous children and youth is important for their current and future well-being.

Health Behaviours that Influence Obesity

At the individual level, weight is influenced by numerous health behaviours. This review will focus on four key influences: physical activity, sedentary activity, sleep, and fruit and vegetable intake. These were selected based on concerns raised during the community engagement sessions where participants discussed low levels of physical activity, poor nutrition choices, insufficient sleep and screen time as impacting child and youth health in the First Nation communities.

Physical activity. Physical activity is any movement of the body involving skeletal muscles that increases heart rate and breathing and results in energy expenditure (Canadian Society for Exercise Physiology, 2017). Physical activity is not limited to exercising but also includes non-exercise activities like doing household chores (Tremblay, Esliger, Tremblay, & Colley, 2007). Benefits of physical activity include improved cholesterol levels, blood pressure,

body composition, bone density, cardiorespiratory and musculoskeletal fitness, lower levels of anxiety and depression, and better academic performance (Biddle & Asare, 2011; Domazet et al., 2016; Larun, Nordheim, Ekeland, Hagen, & Heian, 2006; Mark S. Tremblay, Warburton, et al., 2011). Conversely, physical inactivity is a risk factor for chronic diseases like diabetes and cardiovascular disease and is associated with obesity in both youth and adults (T. Kue Young & Katzmarzyk, 2007). Physical inactivity and sedentary behaviour have been linked to overweight and obesity (M. S. Tremblay & Willms, 2003) as well as being risk factors for metabolic diseases like diabetes and heart disease (Stierlin et al., 2015).

Physical activity can be measured through either direct or indirect measures with advantages and disadvantages to each approach (Bates, 2006). Direct measures of physical activity include observation, motion sensors, heart rate monitors, doubly labelled water, accelerometers and pedometers. The advantages of direct measures are that they are more reliable than indirect measures if used correctly (Adamo, Prince, Tricco, Connor-Gorber, & Tremblay, 2009; Bates, 2006). The disadvantages of direct measures are the expense, the time, intrusiveness, and inconvenience to research participants (Adamo et al., 2009; Bates, 2006). Indirect measures of physical activity can assess type, frequency, duration, and intensity through self-reporting tools like questionnaires or surveys, diaries or journals, and checklists (Adamo et al., 2009; Lévesque, Cargo, & Salsberg, 2004). The advantages of indirect measures are that they are generally non-invasive, relatively inexpensive, and they can be administered with some support (Adamo et al., 2009; Bates, 2006). The disadvantages of indirect measures that rely on self-reporting are that children may have difficulty with recall, children are not time conscious, and children overestimate their activity level (Adamo et al., 2009; Bates, 2006; Lévesque et al., 2004). A systemic review of physical activity measures found that 72% of the indirect measures

overestimated direct measures (Adamo et al., 2009). Despite the variety of direct and indirect measures of physical activity, there is no 'gold standard' for measuring physical activity in children (Adamo et al., 2009).

Canadian guidelines for daily physical activity recommend that children between ages 5 and 17 get at least 60 minutes of daily physical activity at a moderate to vigorous intensity level (Ross, 2016). Based on readings from accelerometers, only 7% of children who participated in the Canadian Health Measures Survey attained 60 minutes/day of moderate to vigorous physical activity (Colley et al., 2011). Getting 30 minutes/day at least 3 days/week of physical activity was achieved by a majority of participants in this study (83% of boys and 73% of girls) (Colley et al., 2011). The Ontario Student Drug Use and Health Survey found that only 22.3% of students in grades 7-12 met the daily physical activity guidelines, with males (27%) more active than females (17.2%) (Boak, Hamilong, Adlaf, Henderson, & Mann, 2016).

Indigenous children and youth have reported low levels of physical activity. Interviews with Indigenous youth (ages 12-17) living off-reserve estimated that boys expended 1.3 kcal/kg/day while girls expended 0.9 kcal/kg/day (P. T. Katzmarzyk, 2008). Because the mean for both was below 1.5 kcal/kg/day, they were categorized as 'physically inactive' (P. T. Katzmarzyk, 2008). Self-reported physical activity levels among Indigenous youth living on-reserve (ages of 12-17) indicate that 49.3% were physically active, 22.6% were moderately active and 28.1% were inactive (First Nations Information Governance Centre, 2012). Both of these studies relied on self-reported data which is less reliable than direct measurement. Direct measures of physical activity using pedometers have found that 36% to 59% of Indigenous children living on reserve were not meeting daily step recommendations (15,000 steps/day for boys and 12,000 steps/day for girls) (Downs et al., 2008; Pigford et al., 2011).

Physical activity has transformed in Indigenous communities from a time when daily activity was physically demanding to a more sedentary lifestyle (Young & Katzmarzyk, 2007). Studies on Indigenous children have found that low levels of physical activity are associated with obesity. Downs and colleagues (2008) found that only 51% of children with central obesity met daily step recommendations and 96% had very poor physical fitness based on shuttle run times. In a similar study, children with central obesity took fewer steps than those who were not abdominally obese however the difference was not statistically significant (Pigford et al., 2011). Identifying the factors that influence this complex behaviour is important to understanding how obesity can be addressed. Because of the important role of physical activity in obesity, it is the focus of the second study and will be discussed further in Chapter Four.

Sedentary behaviour. Pate, O'Neill, and Lobelo (2008) defined sedentary behaviour as, "…activities that do not increase energy expenditure substantially above the resting level and includes activities such as sleeping, sitting, lying down, and watching television, and other forms of screen-based entertainment" (p. 174). Similarly, Tremblay, LeBlanc, et al. (2011) defined sedentary behaviour as, "A distinct class of behaviours (e.g. sitting, watching TV, playing video games) characterized by little physical movement and low energy expenditure" (p. 2). Essentially, sedentary behaviour is behaviour that involves very little movement and low energy expenditure. Sedentary behaviour is distinct from physical inactivity which refers to not meeting daily physical activity guidelines (Sedentary Behaviour Research Network, 2012). Results from the 2012-2013 CHMS found that children aged 7 to 14 were sedentary, on average, 8.3 hours per day (Larouche, Garriguet, Gunnell, Goldfield, & Tremblay, 2016). Sedentary behaviour is of concern among children and youth as it can lead to the early onset of chronic diseases (Colley et al., 2011).

Time spent in front of a screen is an indirect measure of sedentary behaviour with more than 2 hours of screen time per day linked to obesity (Arluk, Branch, Swain, & Dowling, 2003; Colley et al., 2011; M. Gates, Hanning, Martin, Gates, & Tsuji, 2013; ParticipACTION, 2015; Shields, 2006). Screen time is time spent in front of an electronic screen like televisions, computers, tablets, and cellphones. Several theories about why high screen time is associated with obesity are that screen time: displaces physical activity, reduces resting metabolic rate, and alters food consumption patterns (M. Gates et al., 2013). The Canadian Society for Exercise Physiology recommends that children and adolescents get no more than 2 hours of screen time per day however the trend has been towards increasing screen time among children and youth. In the 2004 Canadian Health Measures Survey (CHMS), more than a third (36%) of children aged 6 to 11 had more than 2 hours of screen time per day according to parent-reports and among adolescents (aged 12 to 17) screen time averaged 20 hours/week according to self-reports (Shields, 2006). Results of the 2008/2009 Canadian Youth Smoking Survey found that students in grades 6 to 12 reported spending an average of 7.8 hours per day on screen based activities (Leatherdale & Ahmed, 2011) for a total of 54.6 hours per week. The 2015 results from the Ontario Student Drug Use and Health Survey (OSDUHS) found that 62.6% of students in grades 7-12 self-reported more than three hours of recreational screen time per day and 13% reported seven or more hours a day (Boak et al., 2016). The OSDUHS found that about equal numbers of boys and girls were spending at least three hours per day in front of a screen (Boak et al., 2016). In other studies, boys have self-reported more screen time than girls (Leatherdale & Ahmed, 2011; Gates et al., 2013) however this pattern may have changed in recent years with the increase in social media platforms available on cellphones that may be more appealing to girls. Screen-time has also been associated with depression and anxiety (Liu, Wu, & Yao, 2015; Maras

et al., 2015). Overall, there appears to be a trend towards increasing amounts of sedentary time, much of which is screen time.

At least two studies have presented screen time data among Indigenous populations. According to the 2008/2010 First Nations Regional Health Survey youth on-reserve self-reported spending more than 1.5 hours/day on each of these activities: watching television (38.6%), using a computer (27%), and playing video games (29.7%) (First Nations Information Governance Centre, 2012). In the same study, parents of children aged 6 to 11 reported that their child spent more than 1.5 hours/day on each of these activities: watching television (37%), using a computer (8.3%) and playing video games (20.6%). In a different study that took place between 2004 and 2010 and included six First Nation communities in Ontario, 33.9% of youth reported spending more than 2 hours/day using the internet or playing videogames and 25% reported spending more than 2 hours/day watching television with some individuals who reported up to 3.9 hours/day of screen time (Gates et al., 2013). Screen time among Indigenous children appears to be keeping pace with children in Ontario where 21.9% reported exceeding the two-hour a day guideline for screen time (Statistics Canada, 2017).

Sleep duration. Sufficient sleep is recognized as an important part of healthy living. A systematic review by Matricciani, Olds, Blunden, Rigney, and Williams (2012) found that sleep duration among children aged 5 to 18 has been declining by 0.73 minute per year over the past 100 years. This review also found that historical trends of sleep duration have steadily decreased. Recently developed Canadian guidelines recommend 9 to 11 hours of uninterrupted sleep for children aged 5-13 and 8 to 10 hours per night for youth aged 14-17 years (Ross, 2016). Similarly, the National Sleep Foundation, an American organization, recommends that

elementary school children get between 9 and 11 hours of sleep and that teenagers get 8 to 10 hours of sleep (Hirshkowitz et al., 2015).

Sleep duration has been categorized by Chaput and Tremblay (2007) as short duration when sleep time was less than or equal to 10 hours and long duration if sleep time was ≥10.5 hours. Short sleep duration has been associated with obesity in children and adolescents (M. Gates et al., 2013; Mark S. Tremblay et al., 2007). This may be due to increased hunger, decreased energy expenditure, insulin resistance, and more time available during waking hours to eat (Gates et al., 2013; Mark S. Tremblay et al., 2007). In addition to obesity, short sleep duration has been associated with poor academic performance, injuries and accidents, suicide ideation, and drug and alcohol use (Matricciani et al., 2012). Disordered sleeping patterns among children and youth have been associated with high levels of screen time and lower levels of physical activity (ParticipACTION, 2015; Mark S. Tremblay et al., 2007).

The OSDUHS study found that 59% of Ontario students in grades 7-12 get less than 8 hours of sleep on an average school night (Boak et al., 2016). One study of Indigenous children aged 10 to 18 years living in six Ontario First Nation communities found that 80.2% self-reported getting less than 8 hours of sleep per night (Gates et al., 2013) which is below the 8 to 10 hours recommended for this age group. This study did not find a relationship between short sleep duration and obesity. In another study, Mohawk children in Kahnawake, Quebec were provided with Actiwatches that recorded their sleep time over a period of 3-4 nights. This study found that children aged 7 to 11 were getting an average of 9.12 hours (or 547.69 minutes) of sleep per night (Seganathy, 2014) which is at the lower end of the recommendations for this age group.

Fruit and vegetable consumption. Fruits and vegetables are an important source of nutrients and fiber that are particularly important in the diets of children and adolescents. A national survey found that 62% of girls and 68% of boys ages 9-13 did not meet the Canada's Food Guide recommendation of 5-6 servings of fruits and vegetables per day (Statistics Canada, 2016b). Those who did not meet the recommendations were also more likely to be overweight or obese (Shields, 2006).

Several studies have found that Indigenous children are not meeting the recommendations for fruit and vegetable intake. In one study, the mean intake of fruits and vegetables among First Nations children was below the daily recommendation (ranging from 3.3 to 3.6 servings), well below other children in southern Ontario (ranging from 5.1 to 5.6 servings per day) and below the national average (4.4 to 4.87 servings per day) (Allison Gates et al., 2012). Another study by Downs and colleagues (2008) found that 83.7% of Cree children in the James Bay region consumed fewer than 3 servings of fruits and vegetables per day. In this study, central adiposity was also associated with lower intakes of fruits and vegetables. A systematic review by Gates, Skinner and Gates (2015) found that 52-100% of Indigenous school-aged youth did not meet the *Canada's Food Guide* recommendations for fruits and vegetables. The review also noted that: "… the general trend was for diets that were energy-dense and nutrient poor; sugar sweetened beverage, snack and fast food consumption was high" (p. 248-249).

Meeting the fruit and vegetable recommendations in *Canada's Food Guide* can be difficult if a household is food insecure. The high cost and limited access to good quality fruits and vegetables for Indigenous peoples living on-reserve and in northern, remote communities would make it difficult to meet the recommendations. While *Canada's Food Guide for First Nations, Inuit and Métis* does include traditional food options it does not take into account the

traditional food systems that many Indigenous communities still rely on and its recommendations may be incongruent with traditional diets (Earle, 2011; Power, 2008). Eating a nutritious diet is important for good health, especially for children. Dietary decisions in the six First Nation communities involved in this study will be discussed further in Chapter Five.

Obesity stigma and bias

It is important to recognize that a focus on obesity among individuals is problematic because of the potential for stigmatization and bias not only against adults but also against children (Pont, Puhl, Cook, & Slusser, 2017). By focusing on weight or waist circumference, health and well-being is reduced to the physical aspect while other aspects of health are ignored (Tylka, Annunziato, Burgard, Danielsdottir, Shuman, Davis, & Calogero, 2014). This is in contravention to Indigenous perspectives on holistic health which also includes intellectual, emotional and spiritual health (Dumont, 2005). The concept of health and well-being described by Dumont (2005) is very broad and includes connections to extended family, community, culture, and spirituality as well as connections to the land/environment. Interventions to address obesity usually focus on individual behaviours rather than making community or societal level changes that would support health and well-being (Medvedyuk, Ali, & Raphael, 2017). While this study focussed on childhood obesity, as this was a concern raised during the community engagement sessions, an understanding of the determinants of obesity was sought through focus groups with caregivers.

Conclusion

Obesity has been defined as excess body fat that can lead to health impairments. Obesity in childhood is of concern because it puts children at risk for health problems and can set a trajectory for ill health into adulthood. There are different ways to measure obesity however the

most common way to estimate obesity is Body Mass Index and more recently waist circumference. The evidence in the literature demonstrates that obesity is a problem not only among Canadian children but especially among Indigenous children where obesity rates can double the rate of Canadian children. The causes of obesity on an individual level are complex with genes, organs, hormones and biological systems influencing the regulation of food intake and energy expenditure. Certain health behaviours have been found to be associated with obesity in children and this review considered physical activity, sedentary behaviour, sleep duration, fruit and vegetable consumption and sweet beverage consumption.

Whitaker (2011) suggests that, "…we must ask not only *how* our way of living has changed but *why*" (p. 973). The knowledge gap this thesis addresses is understanding how and why physical activity and nutrition have changed among children in six First Nation communities. The next chapter will describe the research approach, theoretical framework and methods used to examine the relationship between obesity and health behaviours among First Nations children as well as caregivers' perceptions about physical activity and dietary decisions.

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CHAPTER 2

2.0 Research Approach, Theoretical Framework, and Methods

2.1 Research Approach

Indigenous and Western Worldviews

Historically, research in Indigenous communities has been controlled externally (Smith, 1999). In contrast, this research was informed by concerns identified within the study communities through a community engagement process by this researcher. As an Anishinaabe raised on Whitefish River First Nation and educated in both the local First Nation elementary school and in the provincial school systems, I have the advantage of being able to draw from both Indigenous and Western perspectives. Mi'kmaw Elders, Albert and Murdena Marshall, describe this as 'two-eyed seeing' which is being able to understand the world from two different perspectives and being able to draw upon the strengths of each of these worldviews (Martin, 2012). I have been strongly influenced by an Anishinaabe worldview in which the spirit, the circle, earth connection, and relationships are fundamental concepts (Dumont, 2006).

In contrast to an Anishinaabe worldview, Leroy Little Bear (2000) describes the Western worldview as, "…linear and singular, static and objective" (p. 82). Both of these worldviews have influenced the way I think about Indigenous peoples' health and has led me to consider how the complex interrelationships among the social, cultural, spiritual, political, historical and environmental factors that influence individual, family and community health. My perspectives on health are similar to those that were discussed during the community engagement process that took place early in this study. During these engagement sessions participants described health as having physical, emotional, intellectual, spiritual and environmental aspects where there was

balance and connection among all these aspects. Participants also explained that health includes not only individual health but also family and community health. This view of health influenced the theoretical framework that was chosen for this study.

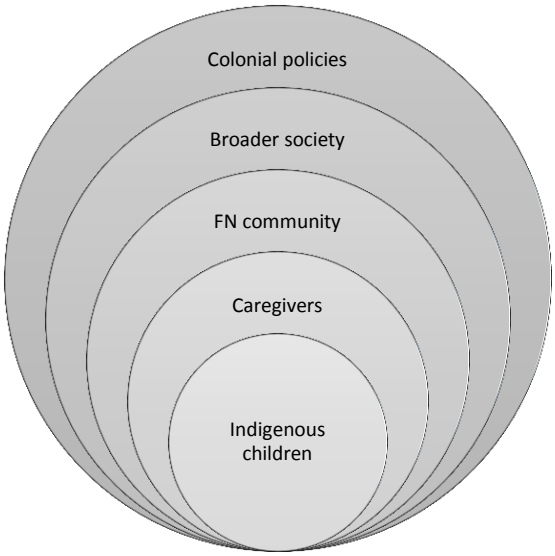
2.2 Theoretical Framework

For this study, obesity among Indigenous children was considered through a socio-ecological framework. An ecological approach is one that considers multi-faceted and interactive factors beyond the individual that influence health behaviours. In Canada, ecological models have been considered an alternative to biomedical and behavioural paradigms (Pigford & Willows, 2010) as early as 1974 with the Lalonde Report which recognized that environmental factors influenced health and examined the role of institutions and government in health (Lalonde, 1974). Another early ecological model was described in the Ottawa Charter for Health which identified fundamental conditions and resources for health (World Health Organization, 1986). Indigenous ecological models have been used to structure approaches to achieving wellness such as the Healing Continuum developed for the Aboriginal Healing and Wellness Strategy (Aboriginal Family Health Joint Steering Committee, 1993), the Cultural Framework used for the First Nations Regional Health Survey (Dumont, 2005), the Integrated Life Course and Social Determinants Model of Aboriginal Health (Reading & Wien, 2009), the Ways Tried and True Aboriginal Methodological Framework for the Canadian Best Practices Initiative (Public Health Agency of Canada, 2015), and the First Nations Mental Wellness Continuum (Restoule, Hopkins, Robinson, & Wiebe, 2015).

This research was framed around the ecological model developed by Willows, Hanley, and Delormier (2012) which describes five spheres of determinants for understanding obesity in Indigenous children. The spheres of influence that influence child health are nested within each

other and include: (1) interpersonal (caregivers); (2) community, home and sociocultural environments (FN community); (3) the built environment (FN community); (4) government policies (broader society); and (5) the broader historical context of colonization, dispossession of land, and assimilation policies (colonial policies) (see Figure 1). The various spheres are interrelated and overlap demonstrating the complexity of outside influences on individual behaviours. This framework was selected because the factors that influence physical activity and dietary decisions are complex and the ongoing effects of colonialism continue to permeate all spheres.

Figure 2. 1. Ecological Model for Understanding Obesity in Children



Adapted from and used with permission by Willows et al, (2012)

This framework is similar to the life course model developed by Reading and Wien (2009) which illustrates the impacts of social determinants on different aspects of health (physical, mental, emotional, and spiritual) at various life stages and whether they are proximal, intermediate or distal. One of the challenges of both these models is that they do not clearly illustrate the effect of agency, meaning that Indigenous peoples are not merely passive receptors

to outside influences but have been taking control of or modifying their situation regardless of structural barriers like poverty, oppression and colonialism. Indigenous peoples in Canada have a long history of challenging colonial authorities including developing their own political organizations, responding to policies such as the White Paper on Indian Policy, and engaging in direct action to protect land.

Determinants of Health

The Social Determinants of Health are known to influence health outcomes and are characterized by the World Health Organization as:

> …the circumstances in which people are born, grow, live, work and age, including the health system. These circumstances are shaped by the distribution of money, power and resources at global, national and local levels which themselves are influenced by policy choices (2017).

Wilkinson and Marmot (2003) identified ten of these circumstances including: the social gradient, stress, early life, social exclusion, work, unemployment, social support, addiction, food, and transport. Indigenous peoples are also significantly influenced by social determinants. For example, First Nations lag behind Canadian communities in measures of education, labour force activity, income and housing (Aboriginal Affairs and Northern Development Canada, 2015). However, a wider perspective beyond the standard social determinants must be considered in order to gain a fuller understanding of the external factors that influence the health of Indigenous populations (de Leeuw, Lindsay, & Greenwood, 2015). Colonialism has been identified as a fundamental determinant of Indigenous people's health (Czyzewski, 2011; Greenwood & de Leeuw, 2012; Reading & Wien, 2009; Smylie & Adomako, 2009). Colonization has been defined by Kelm (1999) as:

> A process that includes geographic incursion, socio-cultural dislocation, the establishment of external political control and economic dispossession, the provision of low-level social services and ultimately, the creation of ideological formulations around race and skin colour that position the colonizer at a higher evolution level than the colonized. (p. xviii)

The process of colonization and the continuation of this ideology is referred to as colonialism and continues to impact Indigenous people to the present day (Wesley-Esquimaux, 2007; Reading & Wien, 2009; Czyzewski, 2011). The impacts from 500 years of colonization include oppression, systemic racism, and loss of control lands and resources (Frohlich, Ross, & Richmond, 2006). Colonization has also disrupted cultural continuity, radically changed the physical and social environments, weakened self-determination, displaced and disconnected people from the land, and subjected Indigenous peoples to racism and marginalization (Postl, Cook, & Moffatt, 2010). The term 'historical unresolved grief' was coined by Brave Heart and DeBruyn (1998) to describe the intergenerational trauma that has resulted from the loss of lives, land, and culture due to colonization. In addition to colonization, Richmond and Ross (2009) have pointed to positive determinants like balance, life control, education, material resources, social resources and environmental/cultural connections as factors that also influence health. When these factors are disturbed the result is poor health outcomes, as has been the case for Indigenous peoples. Children are particularly vulnerable to health inequities, especially those with multiple social risks as is the case for some Indigenous children (Halfon, Larson, & Russ, 2010; Postl et al., 2010). Understanding the biomedical causes of obesity in individuals is important however understanding obesity at a population level must also consider the social, political, and economic environments that also have an impact on health.

Research Questions

This study sought to gain a better understanding of the factors that influence overweight and obesity among Indigenous children in six Anishinaabek communities. The two overarching research questions that guided my research were:

- How do health behaviours influence the Body Mass Index and waist circumference among Indigenous children in six First Nation communities in northeastern Ontario?
- What are the underlying factors that influence cultural beliefs and practices about diet and physical activity?

2.3 Methods

Community Engagement

The national research agenda on children's health has been directed by academic researchers and funding organizations (Stout, Jodoin, Health Canada, & First Nations and Inuit Health Branch, 2006). During the past 15 years on Manitoulin Island, a different approach to research has been taken with First Nation communities taking control of the research agenda. In keeping with this approach, a community engagement process was conducted to identify health research priorities surrounding Indigenous child and youth health on Manitoulin Island (McGregor, 2011). This engagement process informed my doctoral dissertation research topic.

Authority and consent for the community engagement process came from the First Nation Band Councils through Letters of Support or Band Council Resolutions. Ethics approval was granted by the Laurentian University Research Ethics Board and the Manitoulin Anishinaabek Research Review Committee.

Discussion questions were developed in collaboration with a Steering Committee. The study sample included the health staff of two Indigenous health organizations located on

Manitoulin Island and health staff working in six First Nation community health centers. Separate sessions were held with Elders and youth workers. A total of 73 people participated in the discussions.

During the meetings, health behaviours such as low levels of physical activity, poor nutrition choices, insufficient sleep, and screen time were discussed. Although specific health concerns such as diabetes, dental caries, high birth weight and obesity were identified, participants also identified underlying factors that influence health such as residential schools and the child welfare system. Based on this community engagement process, the focus of my dissertation research examined both health behaviours that contribute to obesity as well as the determinants of these health behaviours.

Study Sites

First Nation communities on Manitoulin Island were invited to participate in this study. Because of their shared history, culture, language and proximity, children and caregivers in these communities would have exposure to similar types of food, similar lifestyles and have access to similar health programs. Although all seven of the First Nation communities on Manitoulin were invited to participate in this study one community declined to participate because they felt overburdened by other ongoing research projects while one community did not respond to invitations to participate. In order to increase the study sample size another First Nation community in close proximity was invited to participate. The on-reserve population of the six participating First Nation communities ranged in size from 97 to 1473. The combined on-reserve population of these six communities at the time of data collection was approximately 3,335 (Indigenous and Northern Affairs Canada, 2013).

Recruitment of Student Participants

Students in Grades 6, 7 and 8 (n=137) were recruited through letters to parents that were sent home with students who were attending the on-reserve elementary schools. In those communities where the schools went to Grade 6 or where there was no on-reserve school, letters to parents were mailed or distributed by community health center staff. We obtained written consent from each student participant's parent or guardian. Recognizing the autonomy of children to participate in research, student participants also had to give their assent to participate. We studied 87 Indigenous children between the ages of 10 and 13 years (42 girls and 45 boys). The response rate was 63.5%.

Recruitment of Caregivers

Parents or caregivers of the student participants were recruited through flyers given to students in Grades 6, 7 and 8 at elementary schools and by community health center staff in each community. Posters in the schools and community health centers were also used to advertise the focus groups. A total of 33 caregivers participated in eight focus groups (23 mothers, 4 fathers, and 6 grandparents or guardians). Most participants were women (n=28). Focus groups took place in each community and the majority of participants were women.

Ethical Considerations

Children are a vulnerable population and Indigenous children are an extremely vulnerable population for social, political, and historical reasons. Thus great care was taken in the recruitment, consent and data collection processes. In addition to parental/guardian consent, student participants also had to give oral assent prior to participation. Community consent from each First Nation was obtained either through a Band Council Resolution or a letter of support.

This study received ethics approval from the Laurentian University Research Ethics Board (File # 2012-05-12) and the Manitoulin Anishinaabek Research Review Committee in 2012.

Data Collection

This study utilized three data collection methods: a Food Behaviour Questionnaire, anthropometric measures with students and focus groups with caregivers. Data collection took place between September 2012 and February 2013.

Food Behaviour Questionnaire. A web-based Food Behaviour Questionnaire (FBQ) that has been validated (Hanning et al., 2009) and used with other groups of First Nations children in Grades 6, 7 & 8 (Chard, 2010) was administered to the students in this study. The FBQ is a 24-hour dietary recall survey and has been used to investigate dietary intake and food behaviours of both non-Indigenous and Indigenous children. Questions about physical activity, screen time, and sleep were also added to the FBQ. The FBQ was administered in three First Nation elementary schools. For students who were attending school off-reserve, data collection took place at the community health center. Surveys were completed on desktop or laptop computers and the data was uploaded to a secure server based at the University of Waterloo. The only identifying information linking the data to the student was the consent form that was securely stored in the lead researchers' office in a locked filing cabinet.

The FBQ included a 24-hour dietary recall and a 7-day recall of: physical activity, screen time, and hours of sleep. This survey was completed independently by student participants, with the lead researcher providing support as necessary and took approximately 30 minutes to complete.

Anthropometric variables. Following the completion of the survey, the height, weight, and waist circumference of each participant was measured by the graduate student. These

measures were not available to the participants in order to minimize other children from asking their classmates about their results and potentially stigmatizing them (MacLean et al., 2010). Birth month, year and gender were recorded. Measurement time took approximately 5 minutes per student.

Height was measured (without shoes) to the nearest millimeter with a stadiometer and weight was measured with electronic scales to the nearest 0.1 kilograms using a Health O Meter Professional 500 KL.

Waist circumference was measured with an anthropometric tape (Rosscraft Anthrotape) at the minimum circumference between the iliac crest and the rib cage while the participants were wearing light clothing. Measurement was taken at the end of normal expiration to the nearest 0.5 cm. Waist circumference was measured in duplicate. If the first two measurements differed by more than 2 cm a third measurement was taken. The mean value of the closest two readings was recorded as the measured circumference. Multiple averaged measures is a well recognized method for enhancing the reliability of measures (Janssen, Katzmarzyk, & Ross, 2004). Although the student participants self-reported on their health behaviours, having the researcher take the body measurements eliminated the self-reporting bias for height and weight.

Focus Groups. The purpose of the focus groups was to explore health behaviours related to physical activity and nutrition among families in the six First Nation communities. Caregivers were invited to participate in focus groups and involved mainly parents or grandparents, although a few interested community members also participated. Participants were invited through flyers that were taken home by the student participants and through posters in all six communities. Focus groups took place either at the community health center or in the local First Nation school. Written consent to participate and oral consent for audio-recording was obtained prior to the start

of the focus groups. Semi-structured and open-ended questions focused mainly on how physical activity behaviours and nutrition behaviours have changed in these communities. All focus groups were conducted in English and lasted between 90 and 120 minutes. Focus groups with caregivers provided perspectives on the rapid dietary and physical activity transitions that have occurred in these First Nation communities.

Data Analysis

Analysis of anthropometric measurements and Food Behaviour Questionnaire. The results of the anthropometric measures (height, weight, and waist circumference) along with gender, age and grade level of 87 participants were entered into an Excel spreadsheet. BMI (BMI = body mass/height^2) was calculated to the nearest 0.01 kg/m^2. Height, weight, age and gender were entered into WHO Anthro Software for PC which calculated BMI-for-age and BMI-for-gender percentiles. Students were classified into three categories based on the WHO reference data: normal BMI is <85th percentile, overweight is >85th percentile, and obese is >97th percentile. The BMI z-scores and waist circumference z-scores were calculated using an anthropometric calculator available on the BC Children's Hospital website that was developed by Sharma, Metzger, Daymont, Hadjiyannakis, and Rodd (2015). Students were classified into two waist categories: normal (<90th percentile) or centrally obese (>90th percentile). Z-scores convert scores in a normal distribution to a standard normal distribution and are a better way to compare children's anthropometric measurements because of variability due to growth patterns and gender.

The results from the Food Behaviour Questionnaire were provided by the University of Waterloo in an Excel spreadsheet. The BMI and waist data was merged with the FBQ results and the data set was reviewed for missing data and outliers. One participant was measured for height,

weight and waist circumference but had not completed the FBQ so all of their data was removed from the data set. Another participant was deemed to be an outlier because their height and weight was significantly higher than the rest of the participants and their data was removed from the data set leaving 85 participants.

The data was then imported into Stata, a statistical software package. Histograms for each variable were generated to determine if they were normally distributed. Two-way scatterplots were also generated in order to determine if the relationship between BMI, waist circumference and health behaviour variables were monotonic. Then Spearman's correlations were conducted to determine the strength and direction of the association between two variables.

Analysis of focus groups. Audio-recordings from the eight focus groups were transcribed into Word documents then imported into NVivo 10, a qualitative analysis software program. The transcripts were reviewed for both manifest content (visible, surface level content) and latent content (underlying meanings) according to the content analysis approach described by Babbie (1992). Segments of data were coded with a label that categorized and summarized the data (Charmaz, 2006). The codes were initially derived from the data as perceived by the lead author. Once all the transcripts had been coded, the resulting categories were reviewed and some were collapsed. The categories were presented to the PhD committee who suggested a second review of the data which resulted in the addition of new categories. A preliminary report on the key findings was completed and the results were shared with focus group participants to verify the interpretation of the data. Participants from the original focus groups were invited to member-checking sessions to validate the findings and to solicit insight into the findings. Four of the six communities were represented in these sessions with a total of nine participants. During these member-checking sessions, the findings and categories were discussed and verified as

reflecting the experiences that had been discussed in the initial focus groups. Specific areas were probed for clarification such as fish and game consumption, the use of the term ‘lazy’, and sexual assaults.

The next three chapters, in the form of articles, present the results from this study. Chapter Three presents obesity rates and associations with health behaviours among the student participants. Chapter Four focuses on the determinants of physical activity based on caregiver’s perceptions. Chapter Five focuses the determinants of nutrition based on caregiver’s perceptions.

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CHAPTER 3

3.0 Health Behaviours and Obesity in Indigenous Children (Paper 1)

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3.1 Abstract

Objective: To explore the relationship between health behaviours and obesity among Indigenous children in six First Nation communities in Northeastern Ontario.

Methods: Data was collected from Indigenous students in grades 6-8 through a dietary and health behaviour survey. Anthropometric measurements including height, weight and waist circumference were taken.

Results: The prevalence of overweight/obesity (BMI zscore≥85th percentile value for age- and sex) in children was 65.9% (boys: 65.9%; girls 65.8%). The prevalence central adiposity (CA) (waist circumference $\geq 90^{th}$ percentile) in children was 37.7% (boys: 36.4%; girls 39.0%). Daily physical activity (DPA) of 60 or more minutes per day was associated with a BMI $\leq 85^{th}$ percentile and a waist circumference $\leq 90^{th}$ percentile. Girls consumed 3.5 servings of fruits and vegetables and boys consumed 2.5 servings. Consuming fruit juice at least once a day was directly associated with CA. Normal weight was associated with participation in more than four types of cultural activities in the previous year ($r_s = 0.40$, $p>0.1974$).

Discussion: Health behaviours that are of concern in this population are low fruit and vegetable consumption and the consumption of fruit juice. Protective factors against obesity are 60 minutes of DPA and participation in four types of cultural activities.

Conclusions: Waist circumference is an effective indicator of obesity along with BMI and should be used in public health screening of Indigenous children. Public health messages in First Nation communities should focus on children getting 60 minutes of DPA, increasing fruit and vegetable consumption, and supporting cultural activities. Sleep time and screen time should continue to be monitored in this population.

Key words: Indigenous, children, BMI, waist circumference, obesity

3.2 Introduction

Obesity is known to be more prevalent among Indigenous children in Canada than in the general population. For Indigenous children ages 9 to 14, parent reports indicate that obesity rates range from 16.9% for Metis children, 20% for First Nations children living off-reserve, and 25.6% for Inuit children (Hodgson, 2011). Another study which measured height and weight of Indigenous children not living on a reserve found that the rates of overweight and obesity among boys at 31.2% and girls at 39.7% (Katzmarzyk, 2008). Regional studies of First Nations children, whose height and weight were measured, found variable rates of overweight and obesity ranging from 27% to 73% in these populations (Hanley et al., 2000; Ng, Marshall, & Willows, 2006; Willows, Ridley, Raine, & Maximova, 2013; Zorzi, Wahi, Macnab, & Panagiotopoulos, 2009). In the general Canadian population, childhood overweight and obesity rates decreased from 36.1% in 2004 to 25.8% in 2012/2013 in the 6 to 11 age group (Rao, Kropac, Do, Roberts, & Jayaraman, 2016). In the 12 to 17 age group, the rates of overweight and obesity increased from 32.6% in 2004 to 36.8% in 2012/2013 (Rao et al., 2016). When comparing Indigenous children with children in the Canadian population the prevalence rates of overweight and obesity are much higher among Indigenous children, sometimes double. However, it is difficult to determine any trend in the Indigenous child and youth populations because the only longitudinal study in Canada relies on parent-reports for children and self-reports among youth which is not as reliable as measured data. Parents tend to under-report height among younger children (ages 2 – 11) resulting in an overestimation of overweight (Akinbami & Ogden, 2009). Conversely, adolescents tend to underestimate their weight, females more so than males and overweight individuals more so than non-overweight individuals (Sherry, Jefferds, & Grummer-Strawn,

2007) thus, “measured height and weight remains the gold standard for surveillance” (Akinbami & Ogden, 2009, p. 1574).

Obesity among children is of concern because of the associated short-term and long-term health implications. Obesity can be estimated in several ways however Body Mass Index (BMI) and waist circumference (WC) are measures that can be used to screen for obesity. BMI is a commonly used indicator of obesity however central obesity has been reported to be a better predictor of metabolic syndrome, cardiovascular disease, and type 2 diabetes (Fernández, Redden, Pietrobelli, & Allison, 2004; Goran & Gower, 1999; Kaler et al., 2006; Ng et al., 2006; Pigford, Sanou, Ball, Fehderau, & Willows, 2011; Sharma, Metzger, Daymont, Hadjiyannakis, & Rodd, 2015; Taylor, Jones, Williams, & Goulding, 2000). Metabolic syndrome is a cluster of health conditions that include central obesity, hypertension, elevated triglycerides, low HDL cholesterol, and impaired glucose tolerance (Zimmet et al., 2007). Two studies involving Indigenous children found that 8.3% and 40.5% had metabolic syndrome with central obesity being the most prevalent condition in both studies (Kaler et al., 2006; Zorzi et al., 2009).

Behaviours that have been found to be associated with obesity in children include insufficient fruit and vegetable intake, low levels of physical activity, more than two hours of screen time daily, and less than 9 hours of sleep daily (Ball et al., 2008; Downs, Marshall, Ng, & Willows, 2008; M. Gates, Hanning, Martin, Gates, & Tsuji, 2013; Hanley et al., 2000; Katzmarzyk, 2008; Pigford et al., 2011).

Several studies have found that Indigenous children are not meeting the daily recommendations for fruit and vegetable intake. In one study, the mean intake of fruits and vegetables among First Nations children was below the daily recommendation (ranging from 3.3 to 3.6 servings), below the national average (4.4 to 4.87 servings per day) and well below other

children in southern Ontario (ranging from 5.1 to 5.6 servings per day) (Allison Gates et al., 2012). Downs and colleagues (2008) found that 83.7% of Cree children in the James Bay region consumed fewer than 3 servings of fruits and vegetables per day and was associated with central adiposity. A systematic review of the diets of Aboriginal youth found that 52-100% were not meeting the *Canada's Food Guide* daily recommendations for fruit and vegetable consumption (A. Gates, Skinner, & Gates, 2015). The review also noted that: "… the general trend was for that were energy-dense and nutrient poor; sugar-sweetened beverage, snack and fast food consumption was high" (A. Gates et al., 2015, p. 248-249). In one study, more than 20% of First Nations children consumed soft drinks one or more times per day, and about 80% drank juice one or more times per day (First Nations Information Governance Centre, 2012). Sugary beverages are of concern because they are linked to weight gain in children (Brown, de Banate, & Rother, 2010). One study found that every additional sugar-sweetened beverage equalled a 60% increase in the risk of children becoming obese (Harrington, 2008). Canada's Food Guide does not offer recommendations for the consumption of colas or other soft drinks but it does consider ½ cup of juice as one serving of fruit. The World Health Organization (2015) recommends that sugar sweetened beverages should comprise no more than 5% of the total energy intake of both children and adults.

Physical activity levels among Indigenous children are of concern because many are not meeting the Canadian physical activity guidelines of 60 minutes/day (Tremblay et al., 2011). Self-reported physical activity levels among Indigenous youth (ages 12-17) living off-reserve found that the mean energy expenditure was below 1.5 kilocalories/day placing them in the 'physically inactive' category (Katzmarzyk, 2008). Self-reported physical activity levels among Indigenous youth living on-reserve (ages of 12-17) indicate that 49.3% were physically active,

22.6% were moderately active and 28.1% were inactive (First Nations Information Governance Centre, 2012). Direct measures of physical activity using pedometers have found that 36% to 59% of Indigenous children are not meeting the daily recommendations for step counts (Downs et al., 2008; Pigford et al., 2011).

Studies of Indigenous children have found abdominal obesity to be weakly associated with pedometer step counts (Downs et al., 2008; Ng et al., 2006; Pigford et al., 2011). Physical inactivity usually coincides with sedentary behavior and can be measured by accelerometers or estimated indirectly through screen time. Screen time is time spent in front of an electronic screen like televisions, computers, tablets, and cellphones. The Canadian Society for Exercise Physiology recommends that children and adolescents get no more than 2 hours of screen time per day; more than 2 hours of screen time per day has been linked to obesity (Arluk, Branch, Swain, & Dowling, 2003; Colley et al., 2011; M. Gates et al., 2013; Shields, 2006). In 2014, 21.9% of Ontario children exceeded the two-hour guideline by using an electronic device and 31.8% watched television, movies, and videos for more than 2 hours a day (Statistics Canada, 2017).

Studies that have measured screen time among Indigenous populations in Canada include a national survey in 2008/2010 when 38.6% of youth reported spending more than 1.5 hours/day on video games (First Nations Information Governance Centre, 2012). A regional study that took place between 2004 and 2010 and included six First Nation communities in Ontario found that 33.9% of youth reported spending more than 2 hours/day using the internet or playing video games and 25% reported spending more than 2 hours/day watching television while some individuals reported up to 3.9 hours/day of screen time (M. Gates et al., 2013).

There is a dearth of reported data on sleep time among Indigenous children in Canada. Gates and colleagues (2013) published the results of their study that included 6 First Nation communities in Ontario. Self-reported sleep time of First Nations youth was divided into three categories: <4 hours, 4-8 hours, ≥9 hours. Gates and colleagues (2013) did not find a relationship between short sleep duration and obesity as estimated by BMI.

Although numerous studies of Indigenous children have measured BMI and, to a lesser extent, waist circumference, there are fewer studies that have examined the relationship between obesity and behaviours like screen time, sleep time, and cultural activities among Indigenous children in Canada. This paper focuses on examining the relationship between obesity and health behaviours among Indigenous children in six First Nation communities.

3.3 Methods

The *Giishpin Nonagzwaat Binoojiinyik Kanim Na Majiishkaami* Project (The Healthy Children = Healthy Futures Project) was a cross-sectional study of Indigenous children's diets, physical activity, sleep, screen time, and anthropometrics that was conducted in six Anishinaabek (Ojibway) communities in northeastern Ontario in the fall and winter of 2012 and 2013. The participating First Nation communities were: Aundeck Omni Kaning, M'Chigeeng, Sagamok Anishnawbek, Sheguiandah, Sheshegwaning, and Whitefish River.

Inclusion/Exclusion Criteria

All students in grades 6, 7 and 8 were eligible to participate (n=137). We chose students in grades 6 to 8 because of their maturity, reading level and perceived ability to perform dietary and activity recalls. Prior to commencement, this study was informed by a community engagement process and a research steering committee. Letters of support for this study were received from all six First Nation band councils.

Ethics Approval

This study was approved by the Laurentian University Research Ethics Board and the Manitoulin Anishinaabek Research Review Committee.

Recruitment and Measurement

Students were recruited through letters, posters and fliers distributed at elementary schools and community health centres. We obtained written, informed consent from each student's parent or guardian. Participants also had to assent to participate. The survey was completed in First Nation schools or in the community health centers independently by student participants, with the researcher providing support if necessary, and took approximately 30 minutes to complete. Following the completion of the survey, the height, weight, and waist circumference of each participant was measured by the PI using a standardized protocol described by the World Health Organization (2008) for height and weight and by the Canadian Society for Exercise Physiology for waist measurements (McGuire & Ross, 2008). Basic demographic information was also gathered, including: birth month, year and gender. Measurement time was approximately 5 minutes per student. These methods are described in detail below.

Anthropometric Measures

BMI (BMI = body mass/height^2) was calculated to the nearest 0.01 kg/m^2 (Health O Meter Professional 500 KL). Height, weight, age and gender were entered into WHO Anthro Software for PC which calculated BMI-for-age and -gender percentiles. Students were classified into three categories based on the WHO reference data: normal BMI is <85th percentile, overweight is >85th percentile, and obese is >97th percentile. Waist circumference was measured with anthropometric tape (Rosscraft Anthrotape) at the minimum circumference between the

iliac crest and the rib cage while the participants were wearing light clothing and were standing. Measurement was taken at the end of normal expiration to the nearest 0.5 cm. Waist circumference was measured in duplicate. If the first two measurements different by more than 2 cm then a third measurement was taken. The mean value of the two closest readings was recorded as the measured circumference. Waist circumference measurements were compared with Third National Health and Nutrition Examination Survey (NHANES III) reference data. BMI z-scores and waist circumference z-scores were calculated using an anthropometric calculator available on the BC Children's Hospital website that was developed by Sharma and colleagues (2015). A waist circumference that met or exceeded the 90th percentile was considered to be centrally obese.

Dietary Intake

Dietary intake was assessed using a web-based Food Behaviour Questionnaire (FBQ) that has been validated (Hanning et al., 2009) and used with other groups of First Nations children in grades 6-8 (Chard, 2010). The FBQ is a 24-hour dietary recall survey and has been used to investigate dietary intake and food behaviours of both non-Indigenous and Indigenous children. In this study, the FBQ was administered in three First Nation elementary schools. For students who were attending school off-reserve, data collection took place at the community health center. Surveys were completed on desktop or laptop computers, and the completed surveys were uploaded to a server based at the University of Waterloo.

Students were asked to report their fruit and vegetable consumption for the previous 24 hours. Canada's Food Guide recommends six servings of fruits and vegetables per day for the age group of the students in this study. Students were also asked to report their consumption of three types of beverages: cola, other soft drinks, and fruit juice. The response options were:

several times a day, once a day, a few times a week, about once a week, about once a month, rarely or never.

Health Behaviours

Other health behaviours were assessed using questions added to the Food Behaviour Questionnaire by the Principal Investigator on physical activity, screen time, sleep time, and cultural activities. These questions were added in order to measure various health behaviours that were identified in the literature as being associated with overweight and obesity.

Physical activity. Students were asked to report how much time on an average day they were breathing hard and sweating a little while being physically active. A drop down menu provided the following options: rarely, 15 minutes a day, 30 minutes a day, 45 minutes a day, 60 minutes or 1 hour a day, 75 minutes or 1¼ hours a day, 90 minutes or 1½ hours a day or more than 90 minutes a day. Physical activity levels were categorized into less than 60 minutes a day and 60 minutes or more a day.

Screen time. Students were asked to report their screen time for two separate time periods: one for weekends and the other for weekdays. The following question was asked: "Last weekend, how many hours a day did you spend watching TV/movies, playing video/computer games, or on a computer or cellphone, chatting, texting, emailing or surfing the internet." The next question was similar except it asked about screen time on a school day. Students could choose one of the following responses: none, less than 1 hour a day, 1 to 2 hours a day, 3 to 4 hours a day, 5 to 6 hours a day, 7 or more hours a day, or not sure. Canadian guidelines recommend that children and adolescents get no more than 2 hours of screen time per day (Tremblay et al., 2011). Screen time levels were categorized to 2 hours or less per day and more than 2 hours per day.

Sleep. Students were asked to report the time they typically went to bed and woke up on weekdays and weekends. Levene's test for equality of variances found that the mean difference between weekdays and weekends was not statistically significant. Since the mean difference between the paired observations was not statistically different the paired data was averaged for each participant for a combined variable called 'sleep'. Canadian guidelines recommend 9 to 11 hours of uninterrupted sleep for children aged 5-13 (Ross, 2016). In this study, sleep duration has been categorized short duration if sleep time was <9 hours of sleep and sufficient sleep was >9 hours.

Cultural activities. Students were asked if they participated in traditional cultural activities during the previous year. A drop down menu with a list of activities was provided and participants could check off as many as they wanted. Students could also choose an 'Other' category and type in an activity not on the list.

Statistical analysis

Statistical analyses were performed using Stata for Mac v. 14.2. Descriptive statistics were calculated for each of the 11 variables of interest. Histograms for each variable were generated to determine the nature of their distribution. An sktest, which is a Stata command for a combined test for normality based on skewness and kurtosis, was run on continuous variables to assess the normality of their distribution (StataCorp, 2015). A normal distribution has a skewness of 0 and kurtosis of three. Two-way scatterplots were also generated to visually examine the association between BMI or waist circumference and health behaviour variables. Then Spearman's correlations were run separately for each dependent variable (BMI and Waist Circumference) with each of the 9 independent variables: servings of fruits and vegetables, cola, other soft drinks, and fruit juice, physical activity, weekend screen time, weekday screen time,

sleep, and cultural activities, to determine the strength and direction of the association between variables. Spearman's was chosen over Pearson's due to the categorical nature of the data. The results were combined into a correlation matrix. The probability level (p) of less than 0.05 was used as the criterion of significance.

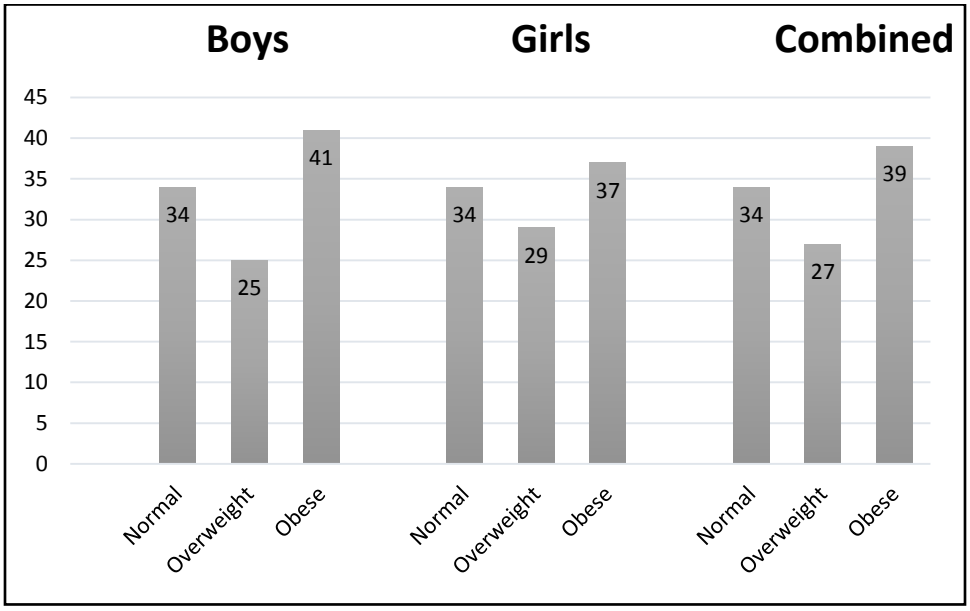
Descriptive statistics comparing boys and girls were generated because the sample size of 85 was large enough that participants would not be identifiable. Statistics comparing participants by community were not generated as participants would be identifiable because of the small number of participants within the specific age groups.

3.4 Results

One hundred and thirty-seven students were residing in the six communities and met the eligibility criteria to participate in this study; 87 received parental consent and 86 provided complete dietary, physical activity, sleep, screen time and anthropometric data (62% of all eligible children). One subject's data were removed from the dataset because their anthropometric results were an extreme outlier and would have unduly influenced the results. Results are reported for 85 participants (44 boys and 41 girls).

Based on BMI, 2/3 of this population (n = 56, 65.9%) were either overweight (n = 23, 27.1%) or obese (n = 33, 38.8%) and 1/3 were normal weight (n = 29, 34.1%). See Figure 1.

Figure 3. 1 BMI percentiles of participants



The rates between boys and girls were very similar with 65% of the boys and 66% of the girls who were overweight or obese.

Waist circumference measurements indicated that over 1/3 (n = 32, 37.6%) of the children had a waist circumference that exceeded the 90th percentile of the NHANES III reference and would be considered to have central adiposity (CA). Equal numbers of boys and girls had a waist size above the 90th percentile (n=16). Of children with CA, 87.8% (n = 29) were obese and 13% (n = 3) were overweight. The raw waist circumference data indicates that 3 out of 44 boys (6%) had a waist circumference greater than 102 cm while 12 out of 41 girls (29%) had a waist circumference above 88 cm which is the cut point for adult females (Alberti, Zimmet, Shaw, & IDF Epidemiology Task Force Consensus Group, 2005). There was a strong positive correlation between waist circumference (cm) and BMI z scores (r_s = 0.8759, p>0).

The mean consumption of fruits and vegetables was under three servings per day, with 9.4% (n = 8) of students who reported that they did not consume any fruits or vegetables on the

previous day. Daily consumption was higher among girls (3.5 servings) compared boys (2.5 servings). The majority (61.5%, n = 51) of the students reported having at least one serving of fruit juice on the previous day. Almost 1/3 (29.4%, n = 25) of the students reported drinking at least one cola and fewer students (13.3%, n = 16) drinking at least one non-cola soft drink.

More boys (n=25) reported getting 60 minutes of daily physical activity compared to girls (n=17). Half of all students who participated in this study (49.4%, n=42) reported 60 minutes or more of daily physical activity. Of those 42 students who reported getting more than 60 minutes of DPA, 14 had a waist circumference that exceeded the 90^{th} percentile and 29 had a BMI $>85^{th}$ percentile.

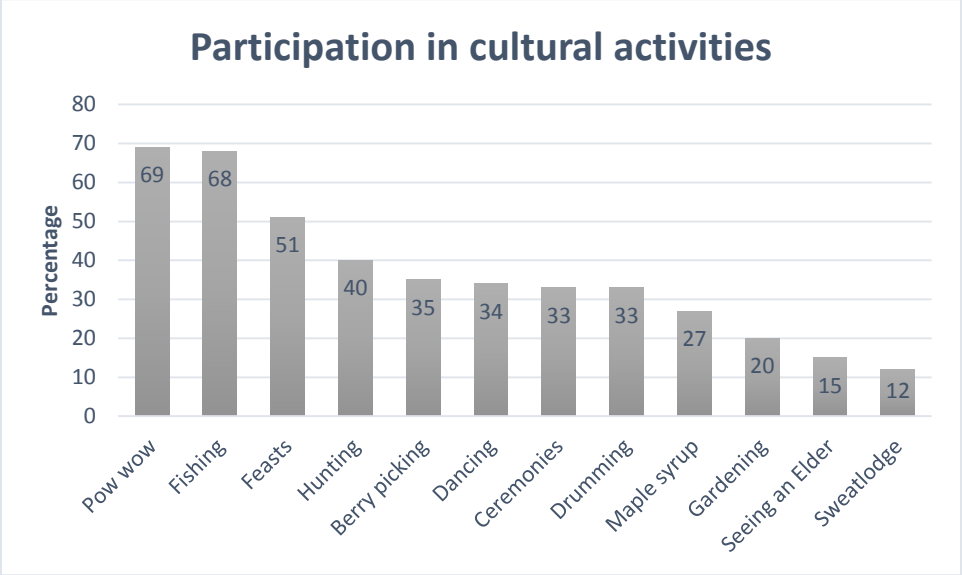
Many (43.4%, n = 36) of the students reported that they were spending more than 2 hours a day on weekdays using some type of electronic screen. Equal numbers of boys (n = 18) and girls (n = 18) reported more than two hours of screen time on weekdays. The results for screen time on weekends was similar to weekdays with about the same number (44.7%, n = 38) of students reporting that they were spending more than 2 hours a day using some type of electronic screen. However, more girls (n = 22, 53.7%) reported more than two hours of screen time on weekends than boys (n = 16, 36.4%).

Because the difference between weekend and weekday sleep data was not statistically significant, sleep data was combined. Students reported getting about 9.6 hours of sleep per night with boys reporting slightly more (9.7 hours) sleep than girls (9.5 hours).

Almost all (97%) of the participants reported participating in at least one cultural activity in the year prior to the survey. A majority of the participants reported going to a pow wow (n = 59, 69%) or going fishing (n = 58, 68%) in the previous year. Half (n = 43, 50.6%) of the participants reported attending a feast in the previous year. Other frequent responses include

hunting (n = 34, 40%), berry picking (n = 30, 35%), pow wow dancing (n = 29, 34%), ceremonies (n = 25, 33%), drumming (n = 25, 33%) or making maple syrup (n = 23, 27%) (see Figure 2).

Figure 3. 2 Participation in cultural activities



This study also focussed on factors that influence obesity and central adiposity. Hence we conducted an exploratory analysis of the relationship between the two dependent variables (BMI and waist circumference) and each of the eight independent variables using Spearman's coefficient, due to the categorical nature of the data. These results are shown in Table 3.1.

Table 3. 1. Correlation matrix

	Waist	Physical activity	Sleep	Cola	Other soft drinks	Juice	Cultural activities
BMI	**r_s=0.88**	r_s=0.15	r_s=-0.10	r_s=0.18	r_s=0.12	r_s=0.05	r_s=0.25
Waist		r_s=0.02	r_s=0.11	r_s=0.13	r_s=0.07	r_s=0.06	r_s=0.22
Physical activity			r_s=0.16	r_s=0.21	r_s=0.16	r_s=-0.03	r_s=0.26
Sleep				r_s=0.3	r_s=0.11	r_s=0.03	r_s=-0.03
Cola					**r_s=0.67**	r_s=-0.02	r_s=0.12
Other soft						r_s=0.02	r_s=0.09

drinks							
Juice							r_s=0.-0.07

Note: Bold indicates correlations that were significant at $p<0.05$.

Each of these independent variables, except for culture, has cut points based on recommendations from the literature. Although fruit and vegetable consumption in this population was about half of what is recommended for this age group, it was not significantly correlated with high BMI or CO. There was a relationship between fruit and vegetable consumption and participation in four or more types of cultural activities (r_s=0.3366)**.** Central adiposity was associated with having juice once a day (r_s = 0.5128, p=0.0731). Neither variable was significantly correlated with screen time or sleep time. Overweight/obesity was associated with participation in fewer than 4 cultural activities in the previous year (r_s = 0.5524, p>0.0077). Normal weight was associated with participation in more than four types of cultural activities in the previous year (r_s = 0.40, p>0.20).

3.5 Discussion

The data presented in this paper indicates that 27% of the sample studied were overweight and an additional 39% were obese, for a total of 66% who had BMI scores above the normal range. The findings reported here are slighter lower that what was reported in Cree children by Willows and colleagues (2013) but higher than Tsimshian children (Zorzi et al., 2009). In the general Canadian population, the childhood overweight and obesity rates have decreased from 36.5% in 2004 to 25.8% in 2012/2013 in the 6 to 11 age group (Rao et al., 2016). In the 12 to 17 age group, the rates of overweight and obesity have remained relatively stable going from 32.6% in 2004 to 36.8% in 2012/2013 (Rao et al., 2016). In comparison to Canadian children, the rates of overweight and obesity among Anishinaabe children were almost double. It is difficult to determine a trend among Indigenous children because the one national longitudinal

study is based on self-reports where weight tends to be under-estimated or through parent reports which tend to overestimate height.

The high rates of overweight, obesity and central adiposity in this population adds to the evidence that obesity rates among Indigenous children are much higher than the general population (Anderson et al., 2010; M. Gates et al., 2013; Katzmarzyk, 2008; Willows, 2005). About 1/3 of the children in this study were centrally obese (CO) based on waist circumference measurements. Children who are overweight and have a high waist circumference are at risk for metabolic conditions (Kaler et al., 2006; Zorzi et al., 2009). Also of concern was that 24 of the participants in this study had a waist circumference above the adult cut points.

Although neither BMI or CO was found to be correlated with fruit and vegetable consumption, children in this study were getting about half of the recommended daily servings per day (boys 2.5 and girls 3.5). Inadequate fruit and vegetable intake among this population is similar to other groups of Indigenous children and below the national average of 4.4 to 4.9 servings per day (Downs et al., 2008). This suggests that food security may be an issue in these First Nation communities despite all being located within one hour driving distance to a grocery store.

About 29.4% of the participants in this study reported having at least one cola on the previous day which is higher than the 20% found in the FNRHS study. A majority (61.5%) of the students reported having at least one serving of fruit juice on the previous day compared to 80% found in the FNRHS study. The relationship between the consumption of soft drinks and high BMI was not statistically significant although consumption of juice was correlated with CO (r_s 0.0649, p=0.5602). This survey did not ask about sport drinks or energy drinks which are popular with children and youth (Reid et al., 2016).

Although half of the students reported getting the recommended amount of daily physical activity (DPA), more boys reported getting more than 60 minutes of DPA compared girls. This supports the evidence that girls get less physical activity than boys (Colley et al., 2011). Normal weight and a waist circumference below the 90th percentile was associated with 60 minutes of DPA. Less than 60 minutes of DPA was associated with CO. Some students with a waist circumference above the 90th percentile and a BMI above the 85th percentile may have overestimated the amount of DPA they were getting which points to the need for measuring DPA rather than relying on self-reports.

About 1/3 of the students reported over 2 hours of screen time whether it was a weekday (36%) or a weekend (37%). The recommended maximum hours of screen time for this age group is 2 hours per day Although BMI and CO was not found to be associated with screen time in this study screen time use has likely increased with the proliferation of cellular service and smart phones since this data was collected in 2012/2013.

The average amount of sleep reported by children in this study was 9.6 hours with some getting as little as 7 hours and others as much as 13 hours per night. The amount of sleep recommended for this age group is 9 to 11 hours of sleep per night (Ross, 2016). Future research on sleep should use electronic devices worn on the wrist to get accurate measures rather than relying on self-reports.

Participation in cultural activities may be a protective factor against obesity. Normal weight was associated with participation in more than four different types of cultural activities in the previous year while overweight and obesity was associated with participation in fewer than four cultural activities. Thompson, Gifford and Thorpe (2000) have argued that "…physical activity is embedded in a complex web of meanings that tie people to their family and larger

Aboriginal community." (p. 724). Although there is much variability among the different types of cultural activities that students reported on, it is likely that cultural activities contribute to overall daily physical activities while connecting them to culture.

The limitations of this study were the small sample size of 85 cases which hindered the strength and power of some of the statistical analysis. Another limitation was that the recall timeframes varied within the survey which may have confused the students. This was a cross-sectional study so we cannot state with certainty the direction of the relationships among the variables. However, there were important strengths in this study. Children in six different communities participated. These communities share a common history, geography, language, and culture. Some of the communities have a small population but by aggregating the data from six communities correlations were made between BMI, CO and health behaviours. Another strength of this study is that height, waist and waist circumference were measured rather than relying on self-reported estimates. This sample may have been biased towards participants who were comfortable being weighed and measured in a school setting.

The prevalence of overweight and CO within this population puts these children at risk for metabolic syndrome. Health assessments of this population should include waist measurements along with height and weight measurements to screen for obesity and to identify children who may be at risk for metabolic syndrome. Clinicians serving these communities should be informed about the results of this study and include waist circumference measurements as part of their practice. Protective factors against obesity include getting more than 60 minutes of DPA as well as participating in at least four different types of cultural activities. These activities should continue to be promoted in schools and in the community. The following health behavior should continue to be monitored in this population: fruit and vegetable consumption,

sweet beverage consumption including sports drinks and energy drinks, physical activity, sleep and screen time.

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CHAPTER 4

4.0 Keeping Kids Safe: Caregiver's Perspectives on the Determinants of Children's Physical Activity in Rural Indigenous Communities (Paper 2)

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This paper has been submitted to the Rural and Remote Health journal and is currently undergoing peer-review.

4.1 Abstract

Introduction: Physical activity is one way to ameliorate the disproportionately high obesity rates among Indigenous children yet little is known about the determinants of physical activity in First Nation communities.

Methods: A socioecological approach was used to explore the determinants that influence physical activity in six First Nation communities in northeastern Ontario. A thematic analysis of eight focus groups with 33 caregivers of Indigenous children was conducted.

Results: Caregivers reported that the present patterns of physical activity among children are different from previous generations who were physically active through walking, outside play and physically demanding chores. Changes in lifestyles, influenced by the consequences of colonization have resulted in reduced physical activity. Three themes emerged as present day impediments to physical activity: recreational technology, caregivers' safety concerns, and barriers to community activation.

Conclusions: Organized sports and recreation programs continue to play an important part in children's physical activity, however financial barriers, lack of program continuity and the associated decline in participation has been discouraging for caregivers. Low volunteerism to organize community activities and the resulting reliance on government appear to be a consequence of 'loss of life control' a condition closely connected to colonial policies. Safety concerns focus primarily on health and social issues in the community that stem from intergenerational trauma created by colonial policies.

4.2 Introduction

Indigenous children are among the most vulnerable groups in Canadian society. Section 35(2) of the Constitution Act, 1982 recognizes three groups of Indigenous peoples in Canada: Indian, Inuit, and Métis. The term Indigenous will be used in this paper when making a general reference to the three groups however First Nation will be used to refer to Indigenous people who live on a reserve. Concern for the health of Indigenous children in Canada was highlighted in a United Nations report which suggested that social conditions are leading to poor health outcomes (UNICEF Canada, 2009). One of these health outcomes, diabetes, has been linked to childhood obesity (T. K. Young, Dean, Flett, & Wood-Steiman, 2000). Childhood obesity is of concern in both the Indigenous population and the broader Canadian population, however the prevalence of obesity is much higher within the Indigenous population (Katzmarzyk, 2008). Physical activity is not only important for overall well-being but also for energy expenditure and maintaining a healthy weight. However, research shows that many Indigenous children are physically inactive (First Nations Information Governance Centre, 2012; Katzmarzyk, 2008) and are not meeting the daily recommendations for physical activity (Downs, Marshall, Ng, & Willows, 2008; Pigford & Willows, 2010). Therefore, it is important to understand what influences physical activity in this vulnerable group. This study draws from a socioecological approach (Willows, Hanley, & Delormier, 2012) and focus groups with caregivers in six rural First Nation communities (reserves) to identify determinants of physical activity among Indigenous children.

Obesity, Physical Activity and Indigenous Children

In the 2011 Canadian census, 1,400,685 people self-identified as Indigenous, representing 4.3% of the total Canadian population (Statistics Canada, 2013). Indigenous people represented the fastest growing population in Canada, as well as the youngest (Statistics Canada, 2013). Over

one quarter (28%) of the Indigenous population were children aged 14 and under, while non-Indigenous children represented only 16.5% of the total non-Indigenous population (Statistics Canada, 2013). The prevalence of obesity in Indigenous children in Canada is much higher than in the general population (Katzmarzyk, 2008). The rate of obesity among Indigenous children and youth living off-reserve was high (34.5%) in comparison to the rest of the population (26.1%) (Katzmarzyk, 2008). Results from the First Nations Regional Health Survey which surveyed 216 First Nation communities found that the rate of overweight and obesity was 62.5% among Indigenous children between the ages of 2-11 (parent-reported) and 43% among Indigenous youth between the ages of 12-17 years (self-reported) living on-reserve (First Nations Information Governance Centre, 2012). Obesity in childhood is of concern because of the increased risk of developing health conditions such as diabetes, cardiovascular disease, and metabolic syndrome (Waldram, Herring, & Young, 2006). Thus, childhood obesity in both the Indigenous and non-Indigenous population is a significant health issue in Canada.

One of the ways to combat this epidemic is through increasing physical activity (M. S. Tremblay & Willms, 2003). Physical activity has been defined as, "any bodily movement produced by skeletal muscles that requires energy expenditure" (Canadian Society for Exercise Physiology, 2017) and involves energy expenditure in both organized, purposeful exercise and non-exercise activity (Mark S. Tremblay, Esliger, Tremblay, & Colley, 2007). Low levels of physical activity and sedentary behaviour have been linked to overweight and obesity among children in Canada (Tremblay & Willms, 2003). The Canadian Health Measures Survey found that, "only 7% of children and youth are meeting Canada's guidelines of 60 minutes of physical activity a day" (Colley et al., 2011). The same study also found that the average amount of sedentary time for children and youth was 8.6 hours per day (Colley et al., 2011). Another

indicator of sedentary behaviour is measured in screen time. A study of Canadian youth in Grades 6 to 12 found that 50.9% reported spending more than two hours per day using a screen based device and the average daily time was 7.8 hours (±2.3 hours) (Leatherdale & Ahmed, 2011). Canadian guidelines recommend limiting screen time to no more than 2 hours per day for children and youth (Canadian Society for Exercise Physiology, 2011).

Physical activity levels among Indigenous children and youth are also of concern. Self reported physical activity levels among Indigenous youth (ages 12-17) living off-reserve found that the mean energy expenditure was below 1.5 kilocalories/day and they were categorized as 'physically inactive' (Katzmarzyk, 2008). Self-reported physical activity levels among Indigenous youth living on-reserve (ages of 12-17) indicate that 49.3% were physically active, 22.6% were moderately active and 28.1% were inactive (First Nations Information Governance Centre, 2012). Both of these studies relied on self-reported data which are less reliable than direct measurement. Direct measures of physical activity using pedometers have found that 36% to 59% of Indigenous children are not meeting the daily recommendations for steps (Downs et al., 2008; A.-A. E. Pigford et al., 2011)10). Physical inactivity among Indigenous children and youth are of particular concern because it is a risk factor for developing obesity related conditions (Halfon, Larson, & Russ, 2010; Shapiro, 2009).

Colonialism as a Determinant of Health

Obesity is influenced by a complex interplay between genetics and physiology (Friedman, 2009; Miller, Rosenbloom, & Silverstein, 2004) as well as the social environment (Halfon et al., 2010). The social environment includes aspects such as income, education, early childhood development and food insecurity also referred to as the social determinants of health (Mikkonen & Raphael, 2010; Wilkinson & Marmot, 2003). First Nation communities lag behind

non-Indigenous communities on determinants such as income, education, housing, labour force activity, health care, welfare and social services (Aboriginal Affairs and Northern Development Canada, 2015).

In addition to the determinants of health identified by Wilkinson and Marmot (2003), determinants that are unique to Indigenous peoples in Canada include colonial legislation and policies like the *Indian Act* and residential schools; loss of land through treaties; and inadequate funding for water treatment systems, housing, health care and education in First Nation communities (Anaya, 2014; Frohlich, Ross, & Richmond, 2006; Darrel Manitowabi & Shawande, 2012). Recently, colonialism has been identified as the key determinant of Indigenous health in Canada (de Leeuw, Lindsay, & Greenwood, 2015). The *Indian Act*, a significant piece of colonial legislation, dictates almost every aspect of First Nations peoples' lives. Another significant instrument of colonialism were residential schools which were operated by churches between the 1800's and 1990's. Indigenous children were often malnourished in these schools (Truth and Reconciliation Commission of Canada, 2015) and some students were subjected to nutrition experiments even when they were clearly malnourished (Mosby, 2013). Many Indigenous peoples are still coping with the effects of colonialism and its intergenerational impact on health status (M. Y. Brave Heart & DeBruyn, 1998; Truth and Reconciliation Commission of Canada, 2015). Studies have shown the negative effect of colonialism on diabetes management, including food choices and physical activity in First Nations communities (Maar, Manitowabi, Gzik, McGregor, & Corbiere, 2011; Manitowabi & Maar, 2011).

Much research on Indigenous peoples' health has been conducted from a biomedical perspective however more recent research is increasingly acknowledging that social determinants

have a significant impact on health outcomes for Indigenous peoples (Loppie Reading & Wien, 2009; Pigford & Willows, 2010; Postl, Cook, & Moffatt, 2010). Understanding the social determinants, including the effects of colonialism, that influence physical activity in Indigenous communities is important in addressing obesity among Indigenous people (T. Kue Young & Katzmarzyk, 2007). Because children are particularly vulnerable to disturbances in their health during their developmental years, identifying the determinants that affect this population is important as these can set a trajectory for their health in the long term (Halfon et al., 2010). The purpose of this research was to identify the determinants that influence physical activity among Indigenous children as perceived by their caregivers in six First Nation communities in northeastern Ontario, Canada.

Socioecological Framework

This research was based on a socioecological framework in order to develop an understanding of determinants of physical activity among Indigenous children. Egger and Swinburn proposed an ecological approach to understanding obesity by recognizing biological, behavioural and environmental influences. Loppie Reading and Wien (2009) developed a life course approach to understanding health inequalities among Indigenous peoples that includes proximal, intermediate and distal determinants of health. Similar to the life course model is the socioecological model proposed by Willows et al. (2012) to understand obesity among Indigenous children in Canada. This framework considers inter-relationships among individuals, families, the community environment, and societal level determinants that influence physical activity and nutrition. A socioecological framework also includes factors such as colonization, dispossession of lands and assimilation policies that influence all levels within the framework. This framework illustrates how social and ecological determinants influence physical activity

among Indigenous children in our study and the barriers that need to be addressed to increase physical activity.

4.3 Methods

A community-based participatory research approach was used in this study beginning with a community engagement process with six First Nations conducted by the lead author. These First Nations were invited to participate because they were located in the study area of Northern Ontario, had identified childhood obesity as a concern, and the lead author had an established research relationship. In the initial stages, information meetings about the project were held within each community. Community consent for a multi-method childhood obesity study was granted by all six First Nation band councils.

Data collection

In this phase of the study, qualitative data was collected during focus groups with caregivers. Participants were recruited through letters of information and posters in each community. Focus group participants consisted of Indigenous parents or grandparents and interested community members. All focus groups were conducted in English and facilitated by the lead author. The focus groups were conducted at First Nations community health centres and schools. Written consent to participate and oral consent for audio-recording was obtained prior to the start of the focus groups. Semi-structured and open-ended questions focused on exploring how physical activity has changed in families and communities. The focus groups lasted between 90 and 120 minutes. A total of 33 caregivers (27 females, 6 males) participated in one of eight focus groups. Most participants were parents of children between the ages of 11 and 14. In two of the focus groups the grandparents were male and female and in one focus group the grandparent was female.

Analysis

The lead author is Indigenous and a member of one of the participating communities, thus giving her both an insider perspective and biases. Because of her personal, professional and educational background she has a dual perspective, or what Albert Marshall describe as, 'two-eyed seeing' (Bartlett, Marshall, & Marshall, 2012), which in this situation means having an understanding of both an Anishinaabe (Ojibway) worldview and a Western worldview. The other members of this research team also contribute to the dual lens of two-eyed seeing, each bringing their own understanding of Western and Indigenous knowledge.

Audio-recordings from the focus groups were transcribed and participants were given pseudonyms. The transcripts were imported into the qualitative data software program QSR NVivo 10 (https://www.qsrinternational.com/) and a thematic analysis was conducted. The transcripts were reviewed for both manifest content (visible, surface level content) and latent content (underlying meanings) according to the content analysis approach described by Babbie (1992). Segments of data were coded with a label that categorized and summarized the data (Charmaz, 2006). The codes were initially derived from the data as perceived by the lead author. Once all the transcripts had been coded, the categories were reviewed and some were collapsed. All of authors then reviewed the resulting preliminary categories and suggested a second review of the data which resulted in the addition of new categories. Categories were reviewed by the research team until all concerns were resolved.

Once a preliminary report on the key findings was complete, the results were shared with participants to verify the interpretation and relevance to the participating communities. Two member-checking sessions were held with selected participants from the initial focus groups to validate the findings and to solicit insight into the findings. Participants were invited from the

original focus groups with a total of four participants in one session and five in the other session. Four of the six communities were represented in these sessions.

Ethics Approval

Ethics approval was obtained from the Manitoulin Anishinaabek Research Review Committee and from the Laurentian University Research Ethics Board (REB# 2012-05-12).

4.4 Results

The discussions during the focus groups were rich with insights about factors that influence Indigenous children's physical activity from the caregivers' perspectives. Participants noted that current patterns of physical activity have been shaped by recent significant lifestyle changes that manifest themselves particularly in outside play, walking and chores. Further analysis of the focus groups found that physical activity is determined by recreational technology, safety concerns, and the impact of colonial legacy on community sports and recreation programs.

Recent Lifestyle Changes

Playing outside: A common theme when discussing physical activity in the past was that participants recalled being sent outside to play for long periods of time when they were children, only going home for meals or when it got dark. While children were outside they would look for other children to play with or they would congregate at a previously agreed upon location like the baseball field. Participants characterized their play as being imaginative because they created games and activities based on what was available in their environment.

> We played outside. We went swimming, we went running, we played Indian ball, we climbed trees, we you know, we made up our own stuff like, our own tree houses, we would do things. – Aangeniinhs

An important element to outside play in the past was that there was little adult supervision, however the participants noted that as children they watched out for each other. In contrast, participants reported that it was difficult to get their children to play outside and the most common reason given was that technology was replacing outdoor play and activities. One parent described her son's typical behaviour:

> Like [the boys] hang out and stuff but that's just usually YouTube and video games, electronic stuff. You wouldn't actually find [my son] down the road or whatever, kind of walking around on his own, just being adventurous. – Maani

Walking: Walking was another frequently mentioned form of physical activity in the past. Participants recalled walking long distances within their communities to play at a friend's place or for activities like swimming. One participant recalled that because her family did not have a vehicle, walking was the only way for her to get around when she was a child:

> I remember, when I was growing up, we didn't have a vehicle. We had to walk everywhere. I remember my friend used to live a mile away and I would walk a mile just to go play with them. We were taught 'go out and play' so we would walk a mile. – Pichi

Participants reported that in the past there were fewer vehicles in the communities and even if there was a family vehicle, participants reported that their parents would likely not have been inclined to drive their children around. In contrast, in the present day, participants reported that their children expect to be driven around their community even for short distances and parents tend to accommodate them.

> Nowadays it's not a problem for kids to ask 'can you give me a ride down to here?' It's like 'Really? We used to walk there. It was not a problem.' 'Oh, it's so far.' 'Jeepers you kids!' – Ziibiinhs

In one community, possibly because of the distance between sub-divisions within the community, participants reported that they observe youths hitch hiking within the community for long periods of time when they could have reached their destination in less time had they walked.

Chores: Participants recalled that as children they were expected to do physically demanding chores as part of their daily activities. The standard of living was quite different than it is today and some homes did not have running water or electricity. In some instances, chores such as splitting wood or hauling water were necessary for their family's survival as illustrated by the following quotes:

> Well, we had to work. In my time, we had to bring some dry wood and get the water. We didn't have the luxury of you got, like we got, we got hydro. We didn't even have hydro. We didn't have running water. We had pumps. Yeah, we had to do our chores. Bring the wood in, chopping the wood, getting water over there and there was about seven of us in my family. We had to do our share. – Wiiyam

In the past, because household chores were physically demanding children became more physically fit simply by completing them. As housing conditions have improved, physically demanding chores that were essential to the functioning of a household in the past have diminished. Some participants reported that their children were still expected to do chores, however these chores tend to be less labour intensive compared to those in the past. One participant compared the difference in level of work:

> *When we were growing up we would get the water from the well, bring it in and heat it up then do the dishes. [nowadays, my son] He has to fill the dishwasher, you know? – Pichi*

Chores are still important in these households, however the level of physical activity required to complete them has decreased.

Technology

Technology was a common theme when participants were asked what has brought about changes in physical activity among children. Participants recalled that when they were younger there were only two channels on television and one telephone in their home. In contrast, participants reported that the pervasiveness of newer forms of technology like computers, video game systems and tablets keeps children indoors and sedentary for hours at a time. The link between technology and sedentary behaviour is described by one participant:

> It's all the new technology that they don't get out – well most kids, I can't say all because there are some who still enjoy going out. But I can speak for my kids – they're wrapped up in the technology. They'll sit and play on their iPads or the computer. It can be a beautiful day out and they'd be sitting there. 'Get outside and do something!' 'Ah, just a minute' 'Okay, it's two hours later and you're still sitting in the same spot! Holy!' – Ziibiinhs

Participants suggested that there has been a proliferation of electronic devices used by children and they identified material scarcity when they were growing up as a reason they indulge their children with electronic devices.

> I think mothers, parents, as parents, we spoil our kids rotten. We buy them all these stuff. All these electronics and they don't go out. They are sitting at the TV. They're playing their games. – Zaben

While the increased use of electronic devices is not unique to Indigenous children, among Indigenous caregivers it is often perceived as a parental response to scarcity experienced during

their childhood. This in turn compels some parents to 'spoil' their children with electronic devices.

Safety Concerns

Caregivers were aware of the importance of physical activity and the negative impact of extended screen time, however during discussions it became clear that they were ambivalent about outdoor activity. In fact, many preferred children to be engaged in indoor activities over outdoor activities because of safety concerns when their children were unsupervised. Four sub-themes emerged as safety concerns: perceived danger from animals such as stray dogs and bears in the community, exposure to drugs and alcohol and to people under the influence of drugs and alcohol, fear of unsupervised play being reported to child protection agencies, and fear of children being at risk for assault or abduction.

Danger from animals: Concerns about dogs running at large and wildlife such as bears were some of the reasons given for allowing children to stay indoors.

> But fear, too, is another thing. There's a lot of stray dogs. Both myself and my daughter have this awful fear of dogs. I know it keeps me housebound unless I'm with my husband, then I'm fine. My daughter won't walk anywhere because of all the stray dogs. – Manyaan

Many First Nation communities struggle with controlling their dog population so much so that it can be a public health and safety issue (Herbert, 2009). These fears are not unfounded with reports of injuries and fatalities from dog attacks in First Nation communities (Raghavan, 2008). In addition to dogs running at large, some participants were concerned that children may encounter bears. Keeping children indoors and safely away from dogs and wildlife has become an approach to keeping children safe resulting in indoor sedentary activities.

Exposure to drugs and alcohol: Fears that children may meet up with impaired drivers or people walking around who are impaired from drugs or alcohol was another safety concern expressed by participants.

> Then you worry about the drugs. People acting out on drugs. You never know if your kid is going to meet up with someone who's totally high on something that doesn't know what they're doing or whatever. – Zhanii

A related concern about drugs and alcohol was about preventing children from getting involved in drugs or alcohol by keeping them at home and under their supervision as exemplified by this quote:

> They settle into their routines of video games, which on one hand is a good thing because they're not out running the roads. They're not going to be involved in drinking because they're at home. We know where they are. – Aan

Higher rates of addictions are one of the many consequences of the colonial history and the related multigenerational trauma manifested in many Indigenous communities (M. Y. H. Brave Heart, 2003; Lemstra, Rogers, Thompson, Moraros, & Buckingham, 2012). The impact is not only on those who live with addictions, but extends to the children in the community as caregivers explained in this research. Keeping their children safe from impaired drivers, encountering people who were impaired and preventing children from drinking alcohol and taking drugs emerged as caregiver priority that overrides concerns over physical inactivity. By keeping children inside, they would be safe from harm and from engaging in harmful behaviours although less physically active.

Child welfare system: Participants described fears of being reported to the child welfare system if they allowed their children to play freely throughout the community because it might be perceived that their children were unsupervised.

> Yeah, there's accidents that have happened along the years and I think it has made people paranoid and the fear factor and stuff like that but also the governing of, you know, 'Well, you're going to get your kids taken away.' – Aangeniinhs

Canada has a long history of state polices that sanction the removal of Indigenous children from the care of their parents that continues to this day. The current disproportionately high number of Indigenous children in the child welfare system are reminiscent of past polices like the residential school system and the 'Sixties Scoop' which systematically removed Indigenous children from their homes (Barrera, 2017). Research shows that 48% of 30,000 children and youth in foster care are Indigenous although the Indigenous people make up only 4.3% of the Canadian population (Aboriginal Children in Care Working, 2015). Thus the statistics indicate that Indigenous caregivers' fears over losing their children into the child welfare system are well-founded and many if not all of the families in participating communities have been touched by forcible removal of their children. Thus unsupervised outdoor physical activity has been curtailed by these experiences and should be taken into consideration for physical activity promotion.

Assault: The fourth concern was keeping children safe from assault. Four of the communities in this study are transected by highways. This leaves children vulnerable to assault or abduction by people passing through the community. One participant recalled how her experience influenced what she teaches her children:

> For me, living so far up there and there not being so many houses. They do get a lot of exercise. It's more of a safety thing. Because I know as a kid walking just a five-minute walk when I was a kid I'd have vehicles stopping like 'Do you want a ride?' even when I was a teenager. I'm just like, 'No, I'm just going there.' I taught them that but it's still a safety concern. – Waaskonye

In this particular quote, the mother expressed that being offered a ride was a safety concern because of strangers driving through the community. Fear of abductions is very real for these caregivers as the high rates of murdered and missing Indigenous girls and women have reached a state of crisis and has resulted in a national inquiry in Canada. Because of this reality, many parents are highly vigilant about safety which includes keeping their children close to home.

Impact of colonial legacy on community programming

Community sports and recreation programs were cited by many of the participants as an opportunity for their children to get physical activity. Participants noted that participation in organized sports off-reserve was expensive and transportation was a barrier. Participants reported that community recreation programs tended to be intermittent and that staffing was inconsistent as a result. Three sub-themes emerged as negative impacts on community programming designed to encourage physical activity among children: low volunteerism, lack of parental support, and reliance on government.

Low volunteerism: Participants noted that volunteerism for community sports programs was low which could result in activities not being available. One participant described the impact that low volunteerism had on community programs:

> Some years the parents will step up and there will be teams. So you'll have one season where there's enough teams for the kids but the next summer – nothing. – Sapi

Parental commitment: In addition to volunteerism, parental commitment was seen as important for the continuation of children's physical activity programs. Participants reported that at the start of a program participation rates are high but as time goes by participation declines. One parent described how this typically happens:

> For organized sports, the parents take them. We had soccer here in the community and we had about four teams for the kids in the school. They started off with full teams and half dropped out or didn't show up afterwards. They stopped coming because parents not driving them. Transportation is {the reason] what I'm guessing. A majority of them live way over [there]. Some parents were consistent in driving their kids so you knew which ones would show up. - Sapi

Parental commitment was seen as necessary for programs to continue as children need their parents not only to encourage them but also to provide transportation to an activity.

Reliance on local First Nation government: Participants described the pervasive expectation among caregivers that the local First Nation band government was responsible for organizing community sports and recreation programs, for paying registration fees, for providing equipment, and for providing transportation. The comments below reflect the frustration that participants felt when confronted with this viewpoint.

> I think it's the parents' expectations that somebody is going to cover my registration cost, somebody else is going to take my child to a hockey game, you know. Stuff like that you see it and you just kind of get burned out and it turns to this negative thing. – Aangeniinhs

While recreational programming is important for physical activity, focus group participants identified low volunteerism, lack of parental commitment and reliance on the local

government/administration as factors that have a negative impact on community sports and recreation programs.

4.5 Discussion

This research on the determinants of physical activity was motivated by concern for the increasing prevalence of obesity among children in these six First Nation communities. This research was also influenced by a commentary on the childhood obesity epidemic by Whitaker (2011) who suggested that "…we must ask not only *how* our way of living has changed but *why*". Further, Willows and colleagues (2012) issued a call for more research on understanding how obesogenic environments in Indigenous communities affect children's physical activity. For that reason, a socioecological approach was used to identify caregiver's perceptions of the determinants of children's physical activity in six First Nation communities. Participants described how physical activity has changed in their communities from their recollections of active childhoods through outside play, walking and physically demanding chores to the much more sedentary behaviour of children. Several factors were identified that influence children's physical activity: technology, safety, and community sports and recreation programming. All factors had ties to the consequences of colonial policies and these root causes must be addressed in order to improve physical activity in the participating communities.

The emerging consequences of colonialism on physical activity

Technology at both the community level and in households has had a significant impact on children's physical activity in these First Nation communities. Community infrastructure has improved over the past 40 years with developments like three-phase electric power and community water treatment systems so that homes now have the capacity for numerous appliances, running water and most have central heating (P. Madahbee, personal communication,

2015). As a result, children are no longer required to perform physically demanding chores that were once required to meet the basic needs of drinking water and heating. These positive developments have contributed to more sedentary behaviours as they have elsewhere in the world.

The participating First Nation communities have improved socio-economically between 1981 and 2011 in measures of income, education, labour force and housing (Aboriginal Affairs and Northern Development Canada, 2015). It is our contention that improvements in labour force activity and income have allowed families with more discretionary spending to purchase recreational technology like computers, video game systems, and tablets. Caregivers noted that indulging children was a response to scarcity experienced as Indigenous people in their childhood. The proliferation of recreational technology tends to support sedentary behaviour rather than physical activity. While the use of recreational technology is likely similar to the broader Canadian society, within these communities it is compounded by caregiver's safety concerns, including a history of state sanctioned removal of children from their families as well as high prevalence of violence particularly against Indigenous girls. This fear of allowing children to be away from their home coupled with a desire to give children what the caregivers themselves did not have provides conditions in which children are allowed to be sedentary for long periods of time.

Fears about dogs and bears, drugs and alcohol, child welfare agencies, and assault led caregivers to prefer indoor activities for their children. Intergenerational trauma from colonialism has contributed to high rates of addictions in First Nation communities (Brave Heart, 2003); caregivers were very concerned about drug and alcohol abuse and keeping children indoors was a response to keeping them safe.

Colonial policies and practices such as residential schools and the 'Sixties Scoop' have also influenced parental preferences for safe, indoor activities. Although the First Nation communities in this study are served by Indigenous child welfare agencies, fears of being reported to these child welfare agencies persist as the rates of Indigenous children in foster care continue to be significantly higher than the non-Indigenous population (Aboriginal Children in Care Working, 2015; Office of the Auditor General of Canada, 2011). As a result, caregivers limit outside play without supervision.

Sexual assault is a grim reality in First Nation communities, particularly against Indigenous women and girls. Indigenous women and girls have long been the target of sexual assault. This issue is of national concern (Native Women's Association of Canada, 2010; Royal Canadian Mounted Police, 2014) and has resulted in a national inquiry into missing and murdered Indigenous women and girls that commenced in 2016. Children are also vulnerable to assaults within the community (Chartrand & McKay, 2006). The prevalence rates of child sexual abuse among Indigenous people is higher than the rates among non-Indigenous Canadians and is estimated to be between 25% and 50% (Collin-Vézina, Dion, & Trocmé, 2009). Limiting unsupervised outdoor play was seen as a way to keep children safe from assault.

Community Programs

Caregivers identified financial barriers as a barrier to participation in sports and recreation programs off-reserve. To address this, First Nation governments have lobbied for and accessed funding for community programs. However, this funding tends to be annualized resulting in uncertainty about whether funding will be continued into the next fiscal year which disrupts program continuity (Office of the Auditor General of Canada, 2011). This colonial

approach to community programming and government stipulating how programs operate has been shown to negatively effect Indigenous health and well-being (Manitowabi & Maar, 2018).

An effect of the First Nation band governments taking the lead on sports and recreation programs rather than these being grass roots initiatives is that community members become reliant on the First Nation band government and are less inclined to volunteer. Caregivers also discussed the expectation that the First Nation band government will finance, staff, equip and transport children to community sports and recreation programs. This expectation is similar to what Richmond and Ross (2009) have termed 'loss of life control' whereby community members have become less self-reliant and more dependent on the Canadian government and local band governments for health and social services. This feeling of disempowerment may be part of the cycle of 'welfare dependency' created by colonial policies (Lutz, 2009). Keeping children indoors and away from animals, drugs and alcohol, apprehensions, and assaults is a way to keep children safe and is a response by caregivers to counteract the 'loss of control' experienced in their lives as a result of colonial policies and legislation.

Implications for Childhood Physical Activity Programs

This study shows that simply advising parents to stop buying electronics for their children or to sign their children up for sports programs is unlikely to improve physical activity and the prevalence of obesity among children in Indigenous communities. This is because there are other factors that strongly influence physical activity among Indigenous children, and many are deeply rooted in colonial history. Foremost, community safety concerns need to be addressed in order to remove barriers to physical activity. Specifically, related to animals, dog management programs need to be established so that children can play outside without the risk of being bitten.

Education on how not deter bears away from the community (i.e., taking proper care of household garbage) as well as traditional teachings about co-existing with bears should be done.

While the higher rates of addictions require long-term community approaches, in the short term the immediate risk for children who play outside should be reduced. For example, efforts to prevent risky behaviour among children include the Drug Abuse Resistance Education program that has been delivered by the tribal police since 1997 and has reached 600 children in the Manitoulin First Nation communities (R. Nahwegahbow, personal communication, 2014). Public health campaigns about impaired driving should be developed with local statistics about its impacts. Increasing the police presence in communities through regular patrols and RIDE spot checks can reduce the number of impaired drivers.

Community sports and recreation programs need to be sustainable with flexible funding that allows for programs to be adapted to the community aspirations and needs. Involving community members in the planning and implementation of community recreation programs can alleviate the feelings of disempowerment. Health messaging that is aimed at families being physically active together can address safety concerns. For example, walking children to school rather than riding the bus or giving them a ride is an activity that caregivers who live close to the school should be able to do. Family participation in traditional activities like hunting, fishing or gathering berries is another way to be physically active and continue cultural activities.

4.6 Conclusions

A socioecological approach has been used to identify the determinants of physical activity among Indigenous children in six rural First Nation communities. The findings show that there was a dynamic interrelationship among the proximal, intermediate and distal determinants of physical activity in the participating communities. The levels of influence include caregivers,

the community environment, broader society and colonialism. These levels are illustrated in Figure 2.1 that was adapted from the socioecological model developed by Willows et al (Willows et al., 2012).

Caregivers perceived dangers to children from animals, exposure to drugs and alcohol, the child welfare system, and assault, and sought to create safety by keeping children indoors, which is a significant change from previous generations. Caregivers also reported on the tendency to indulge children with electronic devices in response to material scarcity experienced in childhood. The proliferation of electronic devices combined with the desire to keep children safe indoors has resulted in an increase in sedentary activity. Caregivers also reported on low volunteerism, declining parental commitment, and reliance on the local First Nation band government to fund, organize, and staff community sports and recreation programs. This disempowerment stems from the colonial legacy of government control over Indigenous peoples living on-reserve.

Technological improvements in community infrastructure has resulted in a better standard of living with running water and sufficient electricity to run numerous appliances. This has resulted in a decrease in physical activity with children no longer required to perform strenuous chores necessary for the functioning of a household. Although they continue to lag behind nearby municipalities, the socio-economic conditions have improved in these communities with some families having a greater disposable income and who are able to purchase recreational technology for their children.

Colonial policies and unstable funding for programs continue to impede progress towards solutions that address the pathologies created by colonial policies, namely substance abuse and sexual assault. Colonial policies continue to disempower Indigenous peoples and impact the

health and well-being of Indigenous peoples living in these six First Nation communities. Community based solutions to addressing safety concerns is the most important way to ameliorate physical inactivity and obesity in these First Nation communities.

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CHAPTER 5

5.0: Caregivers' Perspectives on the Determinants of Dietary Decisions in Six First Nation Communities (Paper 3)

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This paper has been submitted to the International Journal of Indigenous Health and is currently undergoing peer-review.

5.1 Abstract

Colonialism is a fundamental determinant of Indigenous people's health in Canada, yet little is known about its effects on food systems and dietary decisions in First Nation communities. A socioecological approach was used to explore the determinants of dietary decisions made by Indigenous caregivers. Conclusions are drawn from a narrative analysis of eight focus groups involving 33 caregivers in six First Nation communities. Caregivers identified the changes that they have observed in how food is procured, distributed, processed and prepared, along with the nutritional consequences and the sociocultural meanings of these changes. Determinants such as participation in the wage economy, low income, hunting and fishing regulations, availability of fish and game, and the proliferation of inexpensive, processed foods have altered the food systems and influenced dietary decisions made by caregivers in six First Nation communities. Initiatives such as community gardens, community freezers and community hunting camps are ways that these communities are seeking to regain food sovereignty.

Keywords: Indigenous health, nutrition, socioecological approach, determinants of health, colonialism

5.2 Introduction

Poor nutrition has been identified as a barrier to good health among Indigenous children in Canada. Dietary gaps such as not meeting recommendations for daily consumption of fruits and vegetables are critical examples of this issue (Earle, 2011). Obesity and other health outcomes such as anemia, dental caries, heart disease and diabetes have also been linked to poor nutrition among Indigenous populations (Willows, 2005). Poor nutrition is a result of dietary decisions which are influenced by a complex social and political environment. Dietary decisions are made by individuals but need to be considered within a food system. A food system refers to the processes that affect how food is acquired and processed as well as the socio-cultural meanings surrounding food (Willows, 2005). Understanding the determinants that influence food systems in First Nation[1] communities is essential to addressing poor nutrition and preventing negative health outcomes. In this paper we draw from a socioecological approach (Willows, Hanley & Delormier, 2012) that reflects the insights of 33 caregiver participants. Focus groups were conducted to understand how food systems in six rural First Nation communities have changed and to identify the determinants that influence dietary decisions.

5.3 Food Systems and Indigenous Peoples

Indigenous peoples are the fastest growing population in Canada. In 2006, about one-third of this population was under the age of 15 (Statistics Canada, 2008). This young and rapidly growing population is perhaps the first generation of Indigenous peoples who have not relied on

[1] The term 'Indian reserve' has been rejected and communities have renamed themselves as First Nations to reflect their position as the first inhabitants of North America (National Aboriginal Health Organization, n.d.).

traditional foods as an integral component of their diet. Kuhnlein (2009) defined traditional foods as, “those foods that Indigenous Peoples have access to locally, without having to purchase them” (p. 3) while market foods are, “those foods that enter communities often through global industrially sponsored retail outlets, and which must be purchased (e.g. sugar, oil)” (p. 4).

Food is an important way of expressing culture through the methods used to acquire it, the values around how it is distributed and the ways in which it is prepared (Willows, 2005). Food is also linked to the maintenance of social relationships and is important to cultural identity. Willows (2005) states that, “the consumption of traditional foods is more than just about eating; it is the endpoint of a series of culturally meaningful processes…” (p. s33). Traditional food systems have been recognized as being significant for the holistic health of individuals and communities (Kuhnlein, 2009).

Food systems in First Nation communities have been disrupted by colonial policies. For example, in the 1880’s, government agents would limit rations as a way of punishing First Nation communities or to coerce Indigenous leaders into signing treaties (Dickason & McNab, 2009). Access to traditional foods was compromised over generations through the loss of traditional lands. Indigenous peoples were discouraged from their traditional ways of obtaining food such as hunting and gathering and encouraged to take up farming (Dickason & McNab, 2009). This was particularly challenging in areas where the land was not suitable for agriculture. However, when Indigenous people were able to farm the land successfully the government would introduce regulations making it difficult to sell their produce or to invest in new technology (Dickason & McNab, 2009). At present, hunting and fishing regulations limit access to traditional foods through the requirements of costly licensing and enforcement.

The Indian residential school system disrupted family learned processes of preparing foods that had been handed down for generations (Willows et al, 2012). Residential school survivors have reported on the limited amount of food and the poor quality of food available to them as students (Truth and Reconciliation Commission of Canada, 2012). Students were expected to work in the gardens but often times were not allowed to partake in the fruits of their labour (Truth and Reconciliation Commission of Canada, 2012). Hunger was rampant and students often had to resort to stealing food in order to survive (Truth and Reconciliation Commission of Canada, 2012). Students longed for their traditional foods but instead were fed unfamiliar foods like pasta and processed meat (Truth and Reconciliation Commission of Canada, 2012). Dismal conditions at many residential schools were viewed as an opportunity to study the effects of malnutrition and to "assess the adaptability of a diet that was making its supposedly inevitable transition from 'traditional' to 'modern'" (Mosby, 2013, p. 161).

These ongoing assaults on Indigenous food systems over generations have resulted in a transition from a traditional diet that was high in omega-3 fatty acids, low in carbohydrates and rich in micronutrients, to a diet of market foods which is high in trans-fatty acids and carbohydrates, and low in nutrients (Earle, 2011; Willows, 2005). Understanding the impact of this transition on dietary decisions made by caregivers in six First Nation communities is the focus of this paper.

5.4 Methods

The research described in this paper contributes to a larger mixed-methods study seeking to understand health behaviours and obesity among Indigenous children in six First Nation communities. Community consent for this study was granted by all six First Nation band councils and ethics approval was obtained from the university Research Ethics Board. This topic

was identified by Elders, health care workers and teachers within this region as a health priority. This paper reports on the perspectives of caregivers about the dietary decisions made in their households.

Data Collection

Participants in this study were mainly caregivers (parents or grandparents) of First Nation children and interested community members. Participants were invited through fliers that were sent home with students in the First Nation schools and through posters in the community. In the communities that did not have an elementary school, parents and guardians were mailed an invitation to participate.

Focus groups took place either at the community health center or in First Nation schools. Written consent to participate and oral consent for audio-recording was obtained prior to the start of the focus groups. Semi-structured and open-ended questions focused mainly on how and why nutrition has changed from the past to the present. All focus groups were conducted in English and lasted between 90 and 120 minutes. A total of 33 caregivers participated in the focus groups (23 mothers, 4 fathers, and 6 grandparents or guardians). Most participants were women (n=28).

Analysis

The focus groups were facilitated by the lead author, an Indigenous doctoral student and a member of one of the participating First Nation communities, thus giving the author an insider perspective along with particular biases. Given her personal, professional and educational background, the lead author has a dual perspective or what has been described as ‘two-eyed seeing’ (Bartlett, Marshall & Marshall, 2012). This refers to understanding the world from both an Indigenous and a Western perspective. The lead author was supported by both Indigenous and

Western scholars with extensive research experience in children's health and First Nation communities.

This paper draws from a narrative analysis of focus groups with 33 caregivers of Indigenous children in six First Nation communities. Audio-recordings from the focus groups were transcribed then imported into NVivo 10. The transcripts were reviewed for both surface level content and underlying meanings (Babbie, 1992). Segments of data were coded with a label that categorized and summarized the data (Charmaz, 2006). Two member-checking sessions with some of the participants were held to solicit insight into the findings. Further analysis involved labelling and sorting the data into themes and sub-themes around the determinants that influenced the dietary decisions of participants.

5.5 Results

Dietary decisions were found to be influenced by interpersonal, community, and societal level factors as well as historical influences. In this study it was important to hear the voices of the participants who articulated their perceptions around food and nutrition. There were extensive discussions about how food has been procured, contrasting food from the land with market food from the grocery store. Food distribution was affected by the availability of game and fish, high costs, food quality, and transportation challenges. The processing and preparation of food is influenced by time, skills, availability of processed foods, and personal preferences. The health consequences of consuming certain types of food were of concern to the caregivers. Finally, participants referred to sociocultural beliefs around identity, feeling 'lazy', and the value of sharing.

Food from the Land

Participants recalled a time when they relied on 'food from the land' for a substantial portion of their diet as illustrated by this comment: "It was more off the land – land-based type food. And we went with the seasons. Whatever was growing we picked and we ate." Land-based food includes wild game, fish, vegetables from gardens and wild fruit. Participants described the methods for procuring food from the land such as hunting and fishing, gardening, harvesting, and raising livestock.

Hunting and fishing. Hunting and fishing remain culturally significant activities in all participating communities. Participants reported that large game like moose and deer continued to be widely available however small game like rabbit and partridge are scarce. Participants also reported that the indigenous fish stock has drastically declined limiting consumption. Because of limited access to certain types of game and fish, some participants reported that they only eat them at feasts. One of the participants commented on the availability of freshwater fish:

> I think there's fewer fish out there. When we used to go fishing we used to catch a lot of fish. – Sally

Because small game and fish are scarce, participants noted that it took longer to acquire them resulting in a focus on large game like deer and moose. Government regulations also limit when and where hunting and fishing activities can take place. Although there are treaty rights to hunt and fish these practices continue to be infringed upon. An example of this occurred in a sting operation conducted by the Ontario Ministry of Natural Resources when their agents entrapped Indigenous hunters into selling wild game (DiGangi, 1993). This approach to fish and wildlife enforcement by the government was noted by one of the focus group participants:

> They got so much regulation now that they govern, that they want to make sure that they got you. If you can live independently, then they can't govern you. Live off the grid. They make sure, they could take your licence away, they could take a lot of things. The government's got a hold of people now. – Ryan

Harvesting. Participants recalled picking different types of berries for personal consumption or to supplement their income. In the spring families would make maple syrup and apples were picked in the fall apples. Preserves, like jams and pickles, would be made from the foods they harvested.

> My mom was a gatherer. She'd pick raspberries, strawberries, you name it. She got wild plums. She'd make jam out of it, for the winter. All that stuff, even acorns. We saved those too, eh. – Brian

Participants noted that harvesting fruit has declined in recent years.

Gardening. Gardening used to be a seasonal activity in these communities. Participants reported that most families had gardens that would supply them with fresh vegetables during the summer months and root vegetables that could be stored for the winter months.

> We had a huge garden. I remember weeding and being part of that because we all had to take turns and do our share of it. So we had corn, potatoes, beans, turnips ... those kinds of things. Carrots in the garden. My mom did canning. – Addy

Participants reported that there were fewer households with gardens in their community.

Raising livestock. Participants recalled that livestock like chickens, horses, and cows used to be raised in the communities but not many community members do this anymore.

> And my mom, she took care of the chickens and made sure we got our eggs. And we had a cow. That's where we got our milk. – Brian

Traditional methods of procuring food from the land were labour intensive and activities like hunting, fishing, harvesting and raising livestock involved all family members.

Food from the Grocery Store

The shift from land-based food to the grocery store has resulted in significant changes to diets. Grocery stores are between 5 and 52 km away from these communities with mostly processed foods available in convenience stores within the communities. Participants described the high cost but poor quality of fruits and vegetables as well as transportation barriers to obtaining food from grocery stores in towns.

Shopping at a grocery store. Participants reported that in the past their families only went to the grocery store once or twice per month and that the foods purchased were generally staples like flour and sugar and other ingredients to prepare meals from scratch.

> What I remember is that it was things – like we did very little grocery shopping. So, you know, things that came in a can, a bag of sugar, flour, and stuff. – Addy

In comparison, participants reported that they make more visits to the grocery store where mainly processed foods are purchased. This practice is a significant shift from the past when people relied mainly on whole foods from the land.

Cost. Market food in [rural] Ontario is expensive. This was an important consideration in food selection for participants, some of whom had limited incomes and had to ensure that the food they purchased was going to last the entire month. These two quotes illustrate the struggle faced by some families over the affordability of food:

> I try to stretch my money as far as I can but still be nutritious. – Sandra
>
> You don't get too much for your money now. Two hundred dollars worth of groceries doesn't get you much. – Josephine

The high cost of food from grocery stores in [rural] Ontario affected food purchases with some participants who perceived convenience foods to be less expensive than whole foods.

Food quality. Participants commented on the quality of the fruits and vegetables available in the grocery stores. They recalled instances of fruits and vegetables spoiling quickly.

> The stuff we buy [in town] like for me I find if I buy fresh fruit at [the grocery store] and two days later it's like mouldy. – Louise

> The amount of time we go to get fresh fruits and vegetables. Half the time the lettuce will wilt. So it's basically the shelf life of fresh fruits and vegetables. Sometimes we go for a two-week span then we go get fresh stuff. – Alannah

Compounding the problem of poor quality fruits and vegetable in grocery stores is that the foods typically available for sale in the communities are in convenience stores and tend to be snack foods like chips or non-perishable food items.

Transportation. There is no public transportation available in these communities therefore those families who do not have a vehicle find that much of their income can be spent on transportation. Because of the high cost of transportation, they made fewer trips to the grocery store requiring the food they purchased to last longer. This limited the purchase of fresh fruits and vegetables and increased the purchase of shelf stable foods which do not spoil as quickly but are typically nutrient deficient and/or high in sugar, fat, and salt.

> Cost you twenty bucks just to get to town. Hard to get around to those good vegetables right off the shelf. It just doesn't happen. I get to town maybe once a week if that. So yeah, transportation is a big thing. – Kristan

Food procurement in the participating communities has transitioned from the land to the grocery store placing community members at risk for food insecurity. Food insecurity is not only

impacted by the availability of game and fish but also the cost and quality of food, socioeconomic status and transportation costs.

Processing and preparation of food

The way in which food is processed and prepared influences the nutritional quality of the food. In addition, the type of food that is prepared is often based on food preferences. Participants reported that in the past meals were prepared from 'scratch' but now there is a greater reliance on processed foods. This marks a shift from meals made from whole foods to meals prepared with some or all processed food.

Cooking from 'scratch'. Participants noted that in the past most meals were prepared from 'scratch' meaning whole food ingredients were used. Meals tended to be simple – primarily meat and potatoes. Other root vegetables such as carrots or turnips might also be served. Breads and cake were prepared at home.

> Well as a kid I remember my mom making everything from scratch like there was roast, there was always potatoes and a vegetable. And now I don't do that so much. I probably do it maybe four days out of the week. Not consecutively. Once in a while I like to keep it balanced and throw, like, French fries or some processed food [laughs]. – Sally

Some participants reported not having the cooking skills to prepare meals from 'scratch'. Other participants recognized that they should eat more vegetables but do not have the cooking skills to prepare them. Participants also reported having wild game in their freezer but not knowing how to prepare it.

> Like I think we have moose that somebody gave us, from in the winter and, but it's just sitting in our fridge because I don't really know how to cook it. And I know if I try it's going to be awful. – Kristan

Convenience of processed foods. There has been a transition from meals prepared from whole foods to meals that are a combination of home cooked and processed foods. Some participants preferred processed foods because they don't take as long to prepare. Processed foods such as frozen pizza can be heated up quickly.

> Not too much wild. Ready-made, throw it in the oven and it's done. Open the box and throw it in there. Chicken fingers and stuff. Fries, hamburgers already made. – Paula

Personal preferences. Participants reported that food choices were made in consideration of their own preferences and children who were 'picky eaters'. In some families, the high cost of food was a deterrent to preparing food that their family does not like. Some participants indicated that they did not like eating wild game or fish because they either had too much when they were young or were not exposed to it at all and never acquired a taste for it.

> My dad never liked wild meat when we were growing up so we never had it. That's why we were always grocery store people. He wasn't an eater that way so I don't care for it myself now. – Alannah
>
> Fish – but I never ate fish. I just could never acquire a taste for it. – Emily
>
> Especially, too, since it's just me and my son at home. We're both picky eaters, too. Gotta cook what he likes to eat because he doesn't like that deer meat stuff like everyday kind of thing. I gotta cook to his likings, too. – Kristan

The processing and preparation of food in these First Nation communities has undergone a significant transition. In the past most food would be acquired from the land and prepared at home but now most food is purchased and is reheated rather than cooked. Cooking skills have declined and participants reported not having time to prepare meals from scratch. Food

preferences can be seen as individual choice, however there is evidence that highly processed foods that are high in fat, sugar and salt are engineered to be appealing (Moss, 2013).

Nutritional consequences

Participants in these focus groups demonstrated that they were knowledgeable about healthy foods by giving examples of meals they prepared. They also recognized the connection between a poor diet and the risk of developing obesity and diabetes.

Knowledge about healthy foods. Responses from participants indicate that they were knowledgeable about healthy foods.

> And me, myself being, I like to cook. I eat everything fresh as I possibly can, like without adding like cans and all that stuff, like, I cut all that stuff off, MSG, anything. Like, I cut all that stuff off. I just keep it right down to the basics. – Dexter

> I basically cook meat, potatoes, vegetables occasionally rice, pasta. Just fruits and vegetables at home. – Alannah

Health concerns. Participants expressed concern about negative health outcomes related to poor food choices.

> We used to, sometimes too, we didn't have food to eat and we mostly ate scone, corn soup. I bet you that's where all the diabetes came from eating salt pork, stuff like that, eh. Because sometimes, you know there was no, like grocery stores or we didn't have fridges to keep meat, fresh meat all the time. So I think that's where the diabetes stepped in is when we started eating these kinds of foods eh. Like lot of fried, fried bread, you know scone. Salt pork, I remember eating a lot of salt pork when I was young. – Bernadette

> We've started pushing the vegetables on the boys and eating healthy. That's a change for our whole household. That's to prevent diabetes and get them into the habit of it. – Alannah

> I always tell him, no, don't buy pop because of diabetes. It runs in our family. – Kristan

Sociocultural meanings

Acquiring food, selecting what to eat, and preparing food is a complex activity charged with sociocultural meanings. During the focus groups, participants discussed the importance of traditional foods for ceremonies and how eating traditional food is important to their Indigenous identity. In addition to not having the cooking skills and preferring processed foods they also described themselves as too 'lazy' to cook food from 'scratch'. In addition, personal finances have put constraints on the value of sharing.

Ceremonial. Traditional foods like wild game were seen as important for ceremonies like feasts.

> … my mom will can venison and so sometimes the only time we'll eat like that, like the older foods is if we're at a feast at my mom's house or, and then again, she won't make venison stew on a Tuesday. It's almost something special now like you have it after a sweat lodge or something. She'll have venison or like that kind of meat. But I wouldn't make it on like a Wednesday. It's like a special thing for me now. – Sandra

Often, these traditional foods are reserved for special occasions like feasts or ceremonies due to the skill and time required to prepare such foods.

Identity. Eating traditional foods like wild game was seen as important to cultural identity.

So every once in a while I don't mind some game meat or stuff like that just for you know, a change of scenery or a change of diet or what not. But we don't, we don't eat as much as we probably should, as Indians. – Rodney

'Lazy'. Some participants described themselves as 'lazy' when they relied on convenience foods for meals. When probed, two reasons were given for describing themselves in this way – feeling tired and not having enough time to cook a meal from scratch.

It's just that after a day at work then you get home and it's like, ugh, I don't feel like doing the whole food prep of doing a big meal so I throw a pizza in the oven or we'll order a pizza whatever the case may be. But there's nights where I... same thing that lazy mode like, ugh. [laughter] – Sally

Sharing in times of scarcity and abundance. Sharing is a fundamental value within this Indigenous group (Power, 2008). Historically, when food from the land was more abundant, participants reported that people would share food more readily. As food from the land has become scarce, the value of sharing has been eroded. Even though these First Nation communities have improved socioeconomically, some participants described feeling reluctant about sharing food which is in conflict with social mores.

Because the groceries are pretty expensive these days and nobody really shares. – Agnes

Traditional foods were seen as important for ceremonies and for Indigenous identity among some focus group participants. Sociocultural beliefs around the label 'lazy' and the changing value of sharing stem from historical factors related to colonialism. Lazy is one of the racist labels that has been attributed to Indigenous people and appears to have been internalized (Lutz, 2009). Sharing food is a fundamental cultural value but food insecurity appears to have had a deleterious effect on this value.

5.6 Limitations

The participants in this study represent a sample of convenience, who were primarily caregivers of students who participated in another component of this study. These caregivers were interested in discussing nutrition and thus may not represent a broad cross-section within these six First Nation communities. This study was limited by the small numbers of focus group participants relative to the population of each community.

5.7 Discussion

Dietary decisions made by caregivers in these First Nation communities are impacted by sociocultural, environmental, and societal/historical level determinants. In the focus groups, participants described how the food systems in their communities have significantly changed during their lifetime. Traditional practices of accessing food from the land has been restricted and has been attributed to colonization. Colonization has resulted in what the Truth and Reconciliation Commission (2015) referred to as cultural genocide:

> …the destruction of those structures and practices that allow the group to continue as a group. States that engage in cultural genocide set out to destroy the political and social institutions of the targeted group. Land is seized, and populations are forcibly transferred and their movement is restricted. Languages are banned. Spiritual leaders are persecuted, spiritual practices are forbidden, and objects of spiritual value are confiscated and destroyed. And, most significantly to the issue at hand, families are disrupted to prevent the transmission of cultural values and identity from one generation to the next." (Truth and Reconciliation Commission of Canada, 2015, 1)

This system of devaluing Indigenous cultures has affected food systems in these communities. Participants commented on several factors that have detrimentally affected food systems in their

community. These factors include the infringement on and contamination of traditional territories, the modernization and marginalization of culture, participation in the mainstream economy and issues of poverty. Decolonization and the restoration of traditional food systems are offered as a means to revitalizing the food systems in these communities.

Colonization and Contamination of Traditional Territories.

Access to traditional territories to exercise treaty rights to hunt and fish has been hindered by regulations imposed by the colonial government (Chan, Receveur, Batal, David, Schwartz, Ing, Fediuk, Black & Tikhonov, 2014). Focus group participants noted that some freshwater fish and wild game species have declined. The decline in fish can be attributed to overfishing by commercial and sport fishing as well as from invasive species (Hudson & Zieglar, 2014). This is compounded by the risk of increased exposure to contaminants associated with consuming freshwater fish and wild game (Davies, 2001). For example, the *Guide to Eating Fish in Ontario* advises limiting the consumption of pickerel and pike due to mercury (Ministry of the Environment and Climate Change, 2015). Contaminants in fish and game are a result of industrial pollution which is a colonial activity. Fewer fish and concerns about contaminants have decreased consumption of traditional foods (Willows, 2005). Additional barriers to hunting and fishing practices include time constraints, the absence of a harvester in the household, lack of equipment and transportation (Chan et al, 2014).

Harvesting naturally occurring food and medicinal plants from the environment has reportedly declined among the focus group participants. This may be due to a number of factors. There has been a loss of plant habitat not only in the traditional territories but within First Nation reserve boundaries as built environments expand. Environmental contamination and climate change have negatively affected plant growth (Power, 2008). Practices such as controlled

burning which releases the seeds of different plant species are not occurring as frequently as in the past (Kimmerer & Lake, 2001). The interdependence of plants and animals is crucial to diverse habitats. A decline in animal species will decrease the spread of seeds. Finally, Anishinaabe teachings highlight the importance of maintaining reciprocal relationships with plants observing that plants must be harvested respectfully in order to flourish (Kimmerer, 2013). This reciprocal relationship must be maintained in order for food and medicinal plants to thrive. These factors may have contributed to the reported decline in the availability of wild berries and other plants used for food.

Modernization and the Marginalization of Culture

In the past, procuring food from the land through activities like hunting, fishing and gardening was not only labour intensive but key to maintaining social and cultural bonds. The rapid transition to predominantly market food has also been influenced by the decreased availability of smaller game and indigenous fish species. Activities such as harvesting berries and raising livestock have also declined because of changes in socioeconomic conditions whereby more people are involved in the wage economy and do not have the time to engage in these activities (Power, 2008). These changes in hunting, fishing, harvesting and gardening practices have resulted in a decline in the reliance on food from the land.

The decline of gardening activities in these First Nation communities may be due to several reasons. These include smaller, rented properties with a backyard reserved for a field bed; the increase in the commercial production of fruits and vegetables (Dorff, 2014); the loss of gardening knowledge due to the increased availability of commercial produce, decreasing the need to garden; the lack of tools needed for gardening activities; the associated cost of plants and tools; and the labour intensity of gardening (Conway & Brannen, 2014).

Internalized marginalization of Indigenous people is evident in the use of the term 'lazy' by some participants to describe their approach to preparing meals. This label likely stems from a stereotype that has been used to describe Indigenous people e.g., 'lazy Indians' (Lutz, 2009). This stereotype has been internalized by some and may be a way of not taking responsibility for well-being. Not taking responsibility is the result of the colonial legacy of the federal government controlling all aspects of the lives of Indigenous peoples in Canada (Richmond & Ross, 2009). However, using the term 'lazy' in a joking manner can be also seen as an act of resistance to this externally imposed label.

Participation in the Economy and Issues of Poverty

Dietary decisions are determined by food distribution challenges, namely food insecurity. Socioeconomic status affects food security and participants in this study reported that they rely almost entirely on market foods therefore their income directly affects the type and amount of food they can purchase. The quality of store-bought fruits and vegetables has been reported to be poor while processed foods are perceived to be non-perishable and inexpensive. Income also determines whether community members can afford a vehicle or whether they will require a taxi to transport them to a grocery store. The closest grocery stores are between 5 km and 52 km away from these First Nation communities thus transportation is necessary in order to obtain market food. Some of the communities have established food banks in order to address food insecurity among low income households.

Participants were knowledgeable about healthy foods but consistently making healthy food choices continues to be a challenge due to reasons such as the proliferation of processed foods. Processed foods are readily available, are perceived to be inexpensive, and can be prepared quickly. Processed foods have a longer shelf life because they contain high amounts of

preservatives (Moss, 2013). Less perishable foods are selected because people on limited incomes must ensure that food can last an entire month. In addition, cooking skills have diminished along with the perception that there is not enough time to cook from scratch. The practice of preparing traditional foods may have been lost as a result of family interruptions due to residential schools and the Sixties Scoop. Children's exposure to traditional practices of harvesting food would be significantly impacted by their long-term absence from their family and home community.

Decolonization and the Restoration of Traditional Food Systems.

The importance of local food systems in addressing food insecurity, nutrition and health in Indigenous communities has been recognized (Kuhnlein, 2009). Indeed, Alfred and Corntassel (2005) suggest that Indigenous peoples 'decolonize' their diet with natural food sources as one way to regenerate and transform communities. Participants in this study noted that traditional foods remain crucial to Anishinaabek identity. The communities in this study have initiated activities such as community gardens and community freezers where wild game can be stored and shared within the community. In addition to family hunting practices, these communities also gather together for fall hunting camps. The purposes of these communal hunting camps are to share traditional hunting practices as well as to assert rights and to maintain stewardship of the land.

The Anishinabek/Ontario Fisheries Resource Centre conducts educational outreach activities in these communities on traditional fish harvesting practices and food preparation. These initiatives are opportunities to revitalize Indigenous food systems by teaching gardening, hunting, and fishing skills by reconnecting to the land and by connecting with other community members. Restoring local food systems moves Indigenous communities towards food

sovereignty which can lead to increased access to healthy foods and increased physical activity while reconnecting to the land and supporting the maintenance of cultural identity.

5.8 Conclusion

Ultimately, colonial policies and legislation have resulted in the loss of traditional territories, infringed on Indigenous hunting and fishing rights and removed people from their lands that once provided traditional food sources. One of the most significant forces connected to these issues is the legacy of Indian Residential Schools. The Truth and Reconciliation Commission has found that Canada remains systematically, institutionally and structurally colonial and racist (Truth and Reconciliation Commission of Canada, 2012), thus posing ongoing challenges for caregivers trying to make healthy dietary decisions in these First Nation communities. Some of these challenges are accessing food from the land, having enough money for market foods, and preparing healthy meals from whole foods.

Food systems in these six communities have undergone a rapid transition which have influenced dietary decisions. Participants reported that in the past food was sourced through traditional activities like hunting, fishing, gathering, gardening and raising livestock. They reported an almost exclusive reliance on market foods from the grocery store although traditional foods remain culturally significant especially for ceremonial feasts. With fewer available small game animals and the scarcity of some indigenous fish species, food insecurity is an issue in these communities. Participants were aware of healthy foods and were concerned about the health effects of a poor diet but food choices were impacted by the high cost of food, the poor quality of fresh fruits and vegetables, time constraints with less food being prepared from 'scratch', and overall a greater reliance on processed foods.

The economic structures in these communities have also changed with more people being involved in the mainstream economy which limits their time to gather and prepare traditional foods. Dietary decisions were found to be influenced by interpersonal, community, and societal level factors.

Despite the permeation of colonialism, these First Nation communities are taking steps to revitalize their food systems through activities such as community gardens, fishing and community hunt camps. These activities are viewed as opportunities to revitalize Indigenous food systems by reconnecting to the land and reinforcing community and kinship bonds. Cultural practices offer a much needed space where more community members can return to traditional foods, activities and values.

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CHAPTER 6

6:0 Discussion and Conclusions

The purpose of this chapter is to integrate the key findings of the previous three chapters that have been written as papers to be submitted for publication. Chapter 3 reported on the quantitative analysis of the nutrition and behaviour survey along with anthropometric measurements. Chapters 4 and 5 focussed on the qualitative findings from the focus groups with caregivers with Chapter 4 focussing on physical activity while Chapter 5 focussed on nutrition.

Childhood obesity is of concern because: rates are increasing internationally; the increases are most marked among Indigenous populations; and childhood obesity is predictive of ill health into adulthood. Furthermore, the effects of obesity impact physical, emotional, and intellectual health. The rates of overweight and obesity among Indigenous children in different First Nation communities are high, ranging from 27% to 73% (Hanley et al., 2000; Potvin et al., 1999; Willows, Ridley, Raine, & Maximova, 2013; Zorzi, Wahi, Macnab, & Panagiotopoulos, 2009). This study sought to examine the relationship between obesity and fruit and vegetable consumption, sweet beverage consumption, physical activity, screen time, sleep, and cultural activities among First Nations children as well as to identify caregivers' perceptions about physical activity and nutrition in order to understand the determinants of health.

As an Anishinaabekwe and scholar, I worked carefully to ensure this research was done in a respectful way and would lead to scientifically rigorous results. Many scholars have set the expectations for collaborative research with Indigenous communities that begins with community engagement to identify concerns, priorities and research questions (Jacklin & Kinoshameg, 2008; Maar et al., 2011). As such, prior to developing this study the priority health issues of children in First Nation communities in the Manitoulin area was first explored in a

series of thirteen meetings with Elders, health care providers, educators, and youth workers. Concerns were raised about childhood obesity and related conditions such as diabetes, heart disease, and hypertension (McGregor, 2011). Participants also identified concerns about the mental and emotional impacts of obesity on children. Following the community engagement, a review of the relevant literature on childhood obesity and health behaviours associated with obesity was undertaken to inform the research approach, theoretical framework and methodology. This study sought to identify the prevalence of obesity among Indigenous children in six First Nation communities and to gain a better understanding of the determinants of physical activity and nutrition.

6.1 Theoretical Framework

A socioecological theoretical framework was used in this study to consider the proximal, intermediate and distal determinants impacting obesity in this population (Loppie Reading & Wien, 2009; Willows, Hanley, & Delormier, 2012). The spheres of influence that influence Indigenous child health are nested within each other and include: (1) interpersonal (caregivers); (2) community, home and sociocultural environments (FN community); (3) the built environment (community); (4) government policies (broader society); and (5) the broader historical context of colonization, dispossession of land, and assimilation policies (Willows et al., 2012). Colonization has been defined by Kelm (1999) as:

> A process that includes geographic incursion, socio-cultural dislocation, the establishment of external political control and economic dispossession, the provision of low-level social services and ultimately, the creation of ideological formulations around race and skin colour that position the colonizer at a higher evolution level than the colonized. (p. xviii)

The process of colonization and the continuation of this ideology is referred to as colonialism and continues to impact Indigenous people to the present day (Czyzewski, 2011; Reading & Wien, 2009; Wesley-Esquimaux, 2007). Colonialism has been identified as a significant determinant of health for Indigenous peoples (Czyzewski, 2011; Reading & Wien, 2009). The impacts from over 500 years of colonialism include oppression, systemic racism, and loss of control lands and resources (Frohlich, Ross, & Richmond, 2006). Colonialism has also disrupted cultural continuity, radically changed the physical and social environments, weakened self-determination, displaced and disconnected people from the land, and subjected Indigenous peoples to racism and marginalization (Postl, Cook, & Moffatt, 2010).

6.2 Methods

The two overarching research questions that guided my research were:

- How do health behaviours influence the Body Mass Index and waist circumference among Indigenous children in six First Nation communities in northeastern Ontario?
- What are the underlying factors that influence cultural beliefs and practices about food and physical activity?

I addressed these questions in this thesis through a mixed methods design. The first paper in this design is included in Chapter 3 (beginning on page 57). Paper 1 presents the prevalence of obesity in the region of interest and addresses the first research question. The second and third papers are Chapters 4 (beginning on page 84) and Chapter 5 (beginning on page 117). These two papers are based on qualitative data on physical activity and nutrition trends that was collected during eight focus groups with 33 caregivers (parents or grandparents) in each of the six First Nation communities. Paper 2 describes the impediments to physical activity in the six

communities from the perspectives of caregivers. Paper 3 describes how dietary decisions that are made by caregivers are influenced by proximal, intermediate and distal factors.

6.3 Key Findings

BMI and Waist Circumference

The analysis of BMI percentiles recorded from First Nations children in the Manitoulin Island area found that 27.1% were overweight and 38.8% were obese, for a combined total of 65.9%. This prevalence is similar to overweight and obesity rates based on BMI that have been reported from other populations of First Nations children in Canada: Potvin et al. (1999) reported 27%; Hanley et al. (2000) reported 31%; Zorzi et al. (2009) reported 45%; and Willows et al. (2013) reported 73%. In comparison, the combined overweight and obesity rates among Canadian children are between 26% and 36% (Rao, Kropac, Do, Roberts, & Jayaraman, 2016). Thus the rates in this First Nations population are about double that of the comparable Canadian rate.

In my study, 37.6% of the participants had a waist circumference above the 90^{th} percentile which is similar to the rate of 35.9% found in a study of three remote First Nation communities in British Columbia (Zorzi et al., 2009). In comparison, a study by Anderson et al. (2010) found that central adiposity among Caucasian Canadian children ranged between 4.2% and 7.5%. Of concern in this study population was that the raw waist circumference for 12 out of 41 girls (29%) was above 88 cm, which is the cut point for adult females, while 3 out of 44 boys (6%) had a waist circumference greater than 102 cm, which is the cut point for adult males (Alberti, Zimmet, Shaw, & IDF Epidemiology Task Force Consensus Group, 2005). Rates of obesity as determined by BMI (38%) and waist circumference (35.9%) were very close in this population and indicate an increased risk for the development of metabolic conditions.

Health Behaviours

In this study I also examined the following health behaviours of children in relation to obesity: fruit and vegetable consumption, sweet beverage consumption, physical activity, screen time, sleep, and cultural activities.

Nutrition. Child participants were asked to report on their food and beverage consumption on the previous day. Boys reported consuming about 2.5 servings per day of fruits and vegetables and girls reported consuming about 3.5 servings per day. Children in this study were getting about half of the recommended 5 to 6 servings of this fruits and vegetables which is similar to other studies on First Nations children (Downs, Marshall, Ng, & Willows, 2008; A. Gates et al., 2012). In this study, low fruit and vegetable consumption was not found to be associated with high BMI. Central obesity was associated with having juice once a day and 29% of children reported having juice several times per day. This confirms what has been found in other studies where sweet beverage consumption has been linked to obesity in children and teenagers (Clabaugh & Neuberger, 2011; Malik, Schulze, & Hu, 2006).

Physical activity. Children were asked to report how much time on an average day they were physically active. Half (49.4%, n=42) of the children in this study reported getting the recommended daily physical activity (DPA) of at least 60 minutes per day which is similar to what was self-reported in a national study of First Nations children (First Nations Information Governance Centre, 2012). Of those 42 students who reported getting more than 60 minutes of DPA, 14 had a waist circumference that exceeded the 90^{th} percentile and 29 had a BMI $>85^{th}$ percentile which suggests that they may have over-estimated the amount of time spent being physically active or the intensity of the physical activity. Children with a BMI $<85^{th}$ percentile and a waist circumference $<90^{th}$ percentile reported getting 60 minutes or more of physical

activity. Central obesity was associated with less than 60 minutes of physical activity per day which is congruent with what has been found in other studies of First Nations children (Downs et al., 2008; Pigford, Sanou, Ball, Fehderau, & Willows, 2011). More boys reported getting 60 minutes of daily physical activity compared to girls which is similar to what was been reported for Canadian children in the Canadian Health Measures Survey (Colley et al., 2011).

Screen time. Almost half (43.4%) of the students in this study reported spending more than 2 hours using some type of electronic screen on weekdays and weekends. Screen time on weekends was higher among girls. In comparison, a regional study that took place between 2004 and 2010 and included six First Nation communities in Ontario found that 33.9% of youth spent more than 2 hours/day using the internet or playing video games and 25% reported spending more than 2 hours/day watching television with the total for some individuals up to 3.9 hours/day of screen time (M. Gates, Hanning, Martin, Gates, & Tsuji, 2013). In comparison, 21.9% of Ontario children exceeded the two-hour guideline by using an electronic device and 31.8% watched television, movies, and videos for more than 2 hours a day in 2014 (Statistics Canada, 2017). A significant proportion of First Nations children and other children in Ontario are exceeding the 2 hour a day guideline for daily recreational screen time (Ross, 2016).

Sleep. Canadian guidelines recommend 9 to 11 hours of uninterrupted sleep for children aged 5-13 (Ross, 2016). In this study, students reported getting a mean of 9.6 hours of sleep per night with boys reporting slightly more (9.7 hours) sleep than girls (9.5 hours). Short sleep duration has been associated with obesity in children and adolescents (M. Gates et al., 2013; Tremblay, Esliger, Tremblay, & Colley, 2007) however in this study there was no association between <9 hours of sleep and obesity.

Cultural activities. Students were asked if they participated in traditional cultural activities during the previous year. Almost all (97%) of the participants reported participating in at least one cultural activity in the year prior to the survey. Normal weight was associated with participation in more than four types of cultural activities while overweight or obesity was associated with participation in fewer than four types of cultural activities in the previous year. There was variability among the different types of cultural activities that students reported participating in thus further research into how and why cultural activities are associated with normal weight should be explored especially in light of cultural revitalization efforts in First Nation communities. Participation in cultural activities may be a protective factor against obesity.

Key Findings from Caregivers' Perspectives

Focus groups with 33 caregivers were conducted to identify the determinants that impact physical activity and nutrition in these six First Nation communities. The qualitative analysis of these focus groups was designed to address the two main research questions: (a) How do health behaviours influence obesity among Indigenous children? And (b) What are the underlying factors that influence cultural beliefs and practices about food and physical activity? Themes around physical activity and food are discussed below.

Physical activity.

Four themes emerged when caregivers were asked to discuss their children's physical activity: recent lifestyle changes, technology, safety concerns, and the impact of colonial legacy on community programming. Caregivers in this study reported that, in the past, children were very active through outdoor play, active transportation, and physically demanding chores. Improvements in community infrastructure and housing appear to have reduced physical activity

among children. Caregivers also noted that another important influence on physical activity was the amount of time spent by children using recreational technology. This is evident in the self-reports by almost half of the children in this study who reported spending more than 2 hours a day using some type of electronic screen.

Safety was a significant concern among caregivers in these focus groups. Their central focus appeared to be protecting their children from harm at the risk of curtailing their children's physical activity. Children were kept indoors and away from potential harms such as dogs or wild animals. Drugs and alcohol were also identified as a potential source of harm. Caregivers worried about their children being harmed by someone under the influence of drugs or alcohol. They also felt that keeping children at home could prevent their children from using drugs and alcohol. Being reported to child welfare agencies was also a concern if it was perceived by others that children were not being supervised outdoors. Another fear was that of sexual assault. The rate of child sexual abuse among Indigenous people is estimated to be between 25% and 50% (Collin-Vezina, Dion, & Trocme, 2009). Safety concerns expressed by caregivers limited when and where children were allowed to play.

Caregivers also reported low volunteerism, declining parental commitment, and reliance on the local First Nation band government to fund, organize, and staff community sports and recreation programs. This reliance stems from the colonial legacy of government control over First Nations peoples living on-reserve and has led to disempowerment (Manitowabi & Maar, 2018; Wesley-Esquimaux, 2007).

Nutrition. In this study, it was found that dietary decisions made by caregivers were influenced by interpersonal, community, and societal level factors as well as historical influences. Four main themes emerged during the focus groups: the transition from food from the

land to food from the grocery store, food preparation methods, awareness of nutritional consequences, and the sociocultural meanings associated with food.

While hunting, fishing, gardening and harvesting 'food from the land' remains important in these communities, these activities have been limited by hunting and fishing regulations that restrict when and where harvesting can take place, and the decreased availability of fish and game. Food security was an issue and was described in terms of the high cost of food, the poor quality of fruits and vegetables, and transportation challenges. Caregivers discussed how food preparation was influenced by time, cooking skills, availability of processed foods, and personal preferences. The health consequences of consuming certain types of food were of concern to the caregivers, namely diabetes, which is known to affect many First Nations people (Tobe, Maar, Roy, & Warburton, 2015). Finally, participants referred to sociocultural beliefs around the importance of traditional foods to identity, feeling 'lazy', and how the value of sharing has been eroded. Initiatives such as community gardens, community freezers and community hunting camps are ways that these First Nation communities are seeking to regain food sovereignty.

6.4 Integration of Key Findings

Physical activity and nutrition of First Nations children is nested within a complex, interactive environment involving proximal, intermediate and distal determinants of Indigenous health (Reading & Wien, 2009; Willows et al., 2012). The framework for this study reflects these layers of influence and focussed on First Nations children and caregivers within the socioecological context of their community and a paternalistic, colonial environment.

Concern for children's health was the impetus for this study and the focus of a survey that measured their dietary choices, health behaviours and body size. Results from this component of the study found that 66% of the First Nations children were either overweight or obese. Health

behaviours that were associated with overweight and obesity were daily juice consumption and getting less than 60 minutes of physical activity per day. Almost all (97%) of the children reported being involved in at least one type of cultural activity during the previous year. Interestingly, participation in four or more types of cultural activities per year was associated with normal weight. While these results are important from a population perspective it was also important to understand the context and determinants of these behaviours which was achieved through focus groups with caregivers in the six First Nation communities.

The focus groups were critical in gaining an understanding of the historical patterns and contemporary perspectives on nutrition and physical activity in the six communities. The results from these focus groups will be discussed in relation to the layers of influence in the socioecological model developed by Willows et al (2012). The layers of influence include caregivers, the community, the physical environment, broader society and colonialism.

Caregivers. Caregivers have a direct influence on the health and well-being of children. In this study, caregivers discussed the amount time children spent using recreational technology and some surmised that they indulged their children with devices because of the material scarcity that they experienced as children. The use of recreational technology tends to support sedentary activity rather than physical activity. In this study, 43% of the children reported spending more than 2 hours per day using some type of screen-based technology. Screen time has likely increased since this data was collected due to the proliferation of smartphones among children and increased cellular service on Manitoulin Island.

Caregivers are instrumental in their children's nutrition. Caregivers discussed how dietary decisions are influenced by their children's preferences. Because of the high cost of food, caregivers want to ensure that the food they provide is not going to be wasted. While traditional

foods such as wild game and fish remain important in these communities, their limited availability and knowledge of preparation methods relegates traditional dishes to special occasions like feasts. Introducing traditional foods in childhood was seen as critical as wild game and fish is an acquired taste. The result is a transition from traditional, country foods that were once locally sourced and nutritious to market foods which are often highly processed and high in sugar, fat, and salt. The consequences of poor nutrition were well known among the caregivers, namely diabetes which is known to affect many First Nations adults, and they reported that they discouraged children from too much sweet foods and beverages.

Community. At the community level, the dependence created by colonial governments has resulted in feelings of disempowerment. Colonial legislation such as the *Indian Act* has, over the course of generations, conditioned thinking within First Nations away from individual and community agency and self-determination (Manitowabi & Maar, 2018; Wesley-Esquimaux, 2007). In the six participating communities, recreation programs that encourage and promote physical activity have been affected by low volunteerism which has impacted the sustainability of programs. Caregivers discussed the dependence of community members on the First Nation government to support all aspects of recreational programming placing children's recreational activities in a precarious position. These can be clearly seen as the markers of apathy, or "learned helplessness" and is a force that needs to be recognized and overcome when it comes to First Nations' recreation programs.

Children's safety was another community level issue discussed during the focus groups with caregivers. Fears about substance abuse, child welfare agencies and the risks of sexual assault influenced caregiver decisions about children's outdoor activities. Substance abuse has been recognized as a coping mechanism used to deal with intergenerational trauma which is a

legacy of colonialism (Wesley-Esquimaux, 2007). Another reason caregivers in this study were reluctant to allow children to play outdoors unsupervised were fears they would be reported to child welfare agencies as not monitoring their children. The high rate of child apprehension perpetuated by the child welfare system (Blackstock, 2009) has profoundly influenced parents' decision-making behaviours. Concern about the risk of sexual assault has also had the effect of limiting outdoor play. Therefore, children are often kept indoors for safety reasons resulting in sedentary activities.

Community level food systems are undergoing a resurgence with food banks to address food insecurity, programs that encourage both community and household gardens, and community hunt camps. Addressing food security and returning to locally sourced foods has been the focus of programming in the community health centers.

Environment. The physical environment has an impact on children's nutrition and physical activity. Caregivers described how food systems in their communities have transitioned from relying primarily on 'food from the land' to relying on market foods. While hunting, fishing, gardening and harvesting remain important in these communities these activities are constrained by accessibility and availability of fish, game, and wild fruits. Caregivers noted that there were fewer game animals and fish and that provincial laws have infringed on treaty rights. The infringement of treaty rights is a direct impact of colonial legislation. At the time of data collection there were no grocery stores in these communities resulting in few nutritious choices within the community and transportation barriers for some community members to travel to grocery stores.

The physical environment also includes the built environment and these First Nation communities have undergone major infrastructure development with three-phase electrical

power, community water systems, and improvements in housing. These technological changes have impacted physical activity in that children are no longer required to perform physically demanding chores that were once necessary for their family's survival.

Safety concerns related to dogs and bears are of concern within the community environment. Caregivers commented on their fears about children being bitten by dogs or about encountering bears while outside. This has led to a preference for indoor activities which tend to be sedentary.

Broader society. Access to healthy food is further constrained by food insecurity resulting from the high cost of food, the low quality of fruits and vegetables available in grocery stores near the First Nation communities. Dietary decisions are therefore not simply personal decisions but are impacted by political and economic factors. Food insecurity is an economic effect of low income experienced by many in these communities.

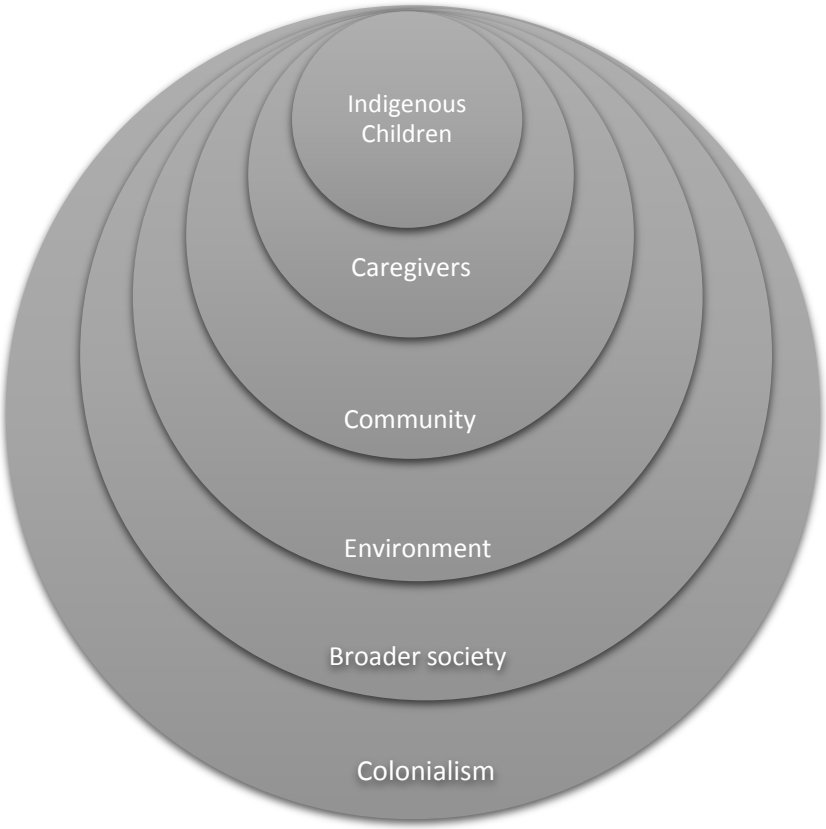
Colonial laws have limited the hunting and fishing rights guaranteed in the treaties and there are fewer game and fish available due to contamination, overhunting and overfishing, and the introduction of invasive species. This has significantly impacted the availability of fish and game.

Colonialism. Caregivers provided broad perspectives on the transitions experienced in their communities and how safety issues influence physical activity and nutrition. In these communities, substance abuse, the child welfare system and sexual assault are all linked to colonialism. These safety issues cause caregivers to focus on protecting children making physical activity a secondary concern. Other consequences of colonialism, like reliance on government, have eroded the collective ability to respond sufficiently as an autonomous community with agency and self-determination.

The spheres of influence impacting physical activity and nutrition in this population are interconnected and dynamic. At the center are First Nations children in these six communities whose health behaviours are influenced by their caregivers. In turn, caregivers have been influenced by the effects of colonialism in the form of safety concerns about substance abuse, fears about the child welfare system, and sexual abuse. Learned helplessness, legislation that restricts access to the land, and food insecurity are also linked to colonialism. Despite the external forces of colonialism, these First Nation communities have been actively resisting the effects of colonialism in many ways such as maintaining traditional practices, developing their own constitution and laws, and through legal challenges. These communities are also pushing back against colonial and societal forces and revitalizing traditional food systems that are seen as important to Anishnaabek identity.

To reflect the importance of children and to visually free them from the oppressive weight of colonialism, I have modified the model proposed by Willows et al. (2012) and put children at the top of the diagram (see Figure 6.1). This also shows that children will be the ones who will continue to challenge oppressive colonial policies so that health and well-being in First Nation communities will continue to improve.

Figure 6.1 Ecological Model for Understanding Obesity in Children - modified



Limitations

This study focused on children's individual health behaviours and caregivers' perspectives in six First Nation communities in northeastern Ontario. Future research will be required to examine the generalizability of these findings beyond this region. The sample size for the quantitative study (paper 1) was 85. This is small in the context of quantitative research, but represented 63.5% of the target population. The study was cross-sectional and thus trends in overweight/obesity cannot be determined. Thus longitudinal data should be collected to determine whether obesity is stabilizing as it is in the Canadian population. However, I was able

to report prevalence rates, and thus add important information to the understanding of the obesity challenge for First Nations children.

In addition to community consent, parental consent was required and the children also had to be willing participants. Recall bias among the child participants may have been a limitation. Questions in the survey may have been challenging for students to respond to because they were asked to recall their behaviours during varying time periods (previous 24 hours, previous 7 days, or previous year). Further, students may have been influenced by a social desirability bias where they responded with how they thought a question should be answered and may not necessarily have represented themselves accurately although I am confident that most students answered the survey to the best of their ability.

The second study was qualitative and the number of focus group participants was 33. Participants were limited to the on-reserve population of these six First Nation communities for whom I was able to obtain full and informed consent. The self-selection of participants in the focus groups may have been biased towards caregivers who were highly interested in children's nutrition and physical activity behaviours. Thus the voices of those who may struggling with other issues or had other priorities were not heard.

6.5 Strengths

This study involved six First Nation communities in northeastern Ontario: Aundeck Omni Kaning First Nation, M'Chigeeng First Nation, Sagamok Anishnawbek, Sheguiandah First Nation, Sheshegwaning First Nation, and Whitefish River First Nation. These communities have had very strong political leadership who have lobbied for improved programs, services and infrastructure. These communities have demonstrated the agency to determine their own way forward. Community members have also held onto their beliefs and traditions despite the

extensive, prolonged and destructive impacts of colonialism. Although these communities are in a unique geographical, social, and economic region, they share a common history of colonization with other First Nation communities and thus the results of this study may be relevant to other First Nation communities.

A key limitation of many studies of childhood obesity is their reliance on parent-reported or self-reported data. Rather than relying on self-reported estimates, height, weight and waist were measured directly by one assessor in this study, thus eliminating an important bias and increasing the accuracy of the final estimates. This data is now available for use as a comparison for longitudinal studies in this region.

Community engagement was an important aspect of this study with community concerns about childhood obesity reflected in the study objectives. Participant voices from the focus groups are represented in chapters 4 and 5 on physical activity and nutrition.

6.6 Policy and Program Recommendations

It is clear from my results and the broader literature, that the single most impactful underlying determinant of obesity in this population is colonialism. What is important is how we use this information to drive solutions that promote good health behaviours and promote recovery.

Nutrition. It is important to note that there were no strong correlations found between obesity and consumption of fruit and vegetables in this study. It is likely that the relationship is multi-factorial and more complex in nature. We encourage community health staff to continue to promote good nutrition. Messaging should aim to exhort balance across food groups, moderation in portions, seeking out a variety of whole or foods in their natural state and traditional foods wherever possible. Efforts to address barriers to achieving a healthy diet related to access and

food insecurity, food deserts in Northern communities, transportation, food selection and food preparation skills, are the work of community dietitians and health staff and should be supported. Healthy eating messaging should aim to incorporate community and cultural strengths-based insights.

Physical activity. Approximately half (49.4%) of the children reported getting the recommended daily physical activity of at least 60 minutes per day. More children in these First Nation communities need to get 60 minutes of daily physical activity to prevent obesity. Innovative approaches to physical activity are needed and should avoid a strict reliance on organized sports which requires active transportation. Safe spaces and opportunities to play and experience the outdoors are needed.

There is a need to frame physical activity in a strengths-based and holistic fashion and include aspects which relate to emotional, spiritual and intellectual growth. Physical activity promoted separately without respecting the whole person is not likely to be as effective as a more holistic approach to encouraging a healthy lifestyle.

Some evidence is emerging that physical activity programs for youth which build on cultural teachings and connection to the land support resiliency and mental wellness (Ritchie et al., 2015). There is a need to return to the original places of learning and growth which were on the land, amongst elders and other knowledge holders and which reinvigorates spirit and authentic identity.

Communities need the resources and decision-making power to determine their needs, then design and implement programs for children. The colonial legacy of government control in First Nation communities must be addressed by empowering community members to take more

responsibility to design and deliver their own culturally appropriate and community driven children's recreation programs with sustainable program funding.

Screen time. At the time of data collection, 40% of the children reported spending more than 2 hours using some type of electronic screen time per day. This data was collected in 2012/2013 when not many children in these communities had cell phones and when cellular service was limited. Data on children's screen time should be collected again to inform the development of community awareness campaigns around limiting screen time.

Sleep. The average amount of sleep reported by children in this study was 9.6 hours per night although some reported getting as little as 7 hours and others reported getting as much as 13 hours. The amount of sleep recommended for this age group is 9 to 11 hours of sleep per night. Similar to screen time, sleep should be measured, rather than self-reported, because the proliferation of smart phones may interrupt sleep. Short or poor quality sleep is linked to obesity as it increases the stress hormone cortisol and de-regulates the appetite leading to increased food consumption. Moving beyond the assumption that screen time is the only barrier to quality sleep, further work is needed to explore the reasons for poor sleep hygiene amongst Indigenous children. Well-rounded strategies to improve and enhance sleep hygiene are needed. Such strategies should be developed with the input of community, care-givers and children and include culturally tailored approaches and evidence-informed messages. Language, visual appeal, cultural teachings can enhance such messaging.

Water. Sweet beverages such as fruit juice and soft drinks are a source of empty calories for this population. Water should be encouraged in school and at home as the natural, healthy and free choice over sweet beverages. A holistic approach should be considered with traditional teachings around water as a life giving force and sacred gift and not to be wasted.

Food systems. Food systems in First Nation communities can be strengthened by supporting families to develop skills in hunting, fishing, gardening and harvesting wild food. Government has a role to play to ensure access to the resources to enable families to return to the land for these activities. Sharing lessons learned from initiatives such as community hunting camps and family gardens among all of these communities would be beneficial. Food insecurity is being addressed by activities like food banks, nutrition programs in schools, and the Good Food Box program; however low income families need more assistance with transportation to grocery stores and higher income to purchase healthy food.

Future health care needs. The high rate of obesity in this population has implications for future health care needs in these First Nation communities. In this study, central obesity was strongly correlated with a high BMI thus waist circumference is another reliable indicator of obesity. Waist circumference should be used by health care professionals to screen children for obesity along with BMI. Referral systems to appropriate health care providers such as the BALANCE program at Health Sciences North in Sudbury, Ontario need to be developed to begin help children and families address obesity.

Self-determination

To counteract the effects of colonialism, community-driven, designed and controlled responses can be supported in several ways:

Community-driven - communities need the leeway to design and drive their own cultural strengths-based and community appropriate programs.

Strengths-based – sound reflection of Indigenous teachings and cultural practices which sustained and enhanced health for millennia before colonial disruption.

Holistic – isolated and discrete interventions cannot adequately address the multi-faceted nature of childhood obesity. Community programming must integrate the physical, mental, emotional and spiritual aspects of healthy lifestyles.

Coordinated – any programming or service interventions must be nested in an ecological framework that provides a multi-pronged approach at all levels from individuals, family, community, society and broader policy.

Prevention – the trajectory for ill health into adulthood is inevitable unless effective interventions that involve children and families are implemented.

6.7 Future research

This paper provides cross sectional data on childhood overweight and obesity in six First Nation communities and presents important qualitative results to shape our understanding of the root causes and relationships. To build upon the initial findings of this study, further research in three areas is recommended.

BMI and waist circumference. Longitudinal data on BMI and waist circumference should continue to be gathered on this population to determine trends and anticipate health care needs.

Physical activity and sleep. Rather than relying on self-reports, physical activity should be measured through fitness watches such as a Fitbit which can track steps, heart rate and sleep. Physical fitness should also be measured using the 20 metre shuttle run test, also known as a beep test.

Cultural activities. More research in order to understand the mechanisms through which cultural activities are protective factors against obesity is an area that should be explored. A

strengths-based, participatory community based approach involving cultural knowledge holders should be considered in such research.

6.8 Conclusions

In this study, I sought to understand the extent of the problem of overweight and obesity among children in six First Nation communities and the determinants of physical activity and nutrition. The rate of overweight and obesity in this population was high (65.9%) and was similar to other populations of First Nations children. Caregivers provided rich insight into the determinants that influence children's physical activity and nutrition in these six First Nation communities. Their insights revealed intermediate and distal factors that point to the influence of colonialism as a fundamental determinant of health. Despite these external forces, First Nation communities in this study have been taking greater control of their environments, programs and services and moving towards sustainable, self-determined approaches to healthy living. It is hoped that this will improve physical activity and nutrition and lead to better overall health and well-being of Indigenous children.

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Appendix A: Letters of Information & Consent Forms

Letter of Information for Parents/Guardians of Students in Grades 6, 7 & 8

Research on Physical Activity and Nutrition among Aboriginal Children

Investigator: Lorrilee McGregor, M.A.
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Community Partners: **Aundeck Omni Kaning, M'Chigeeng, Sagamok Anishnawbek, Sheguiandah, Sheshegwaning, and Whitefish River**

Aanii! Boozhoo!

I am a Ph.D. student at Laurentian University in the School of Rural and Northern Health conducting a research study to gain a better understanding of physical activity and nutrition among Aboriginal children.

Procedures involved in the Research

I would like to invite your child to participate in a survey about their physical activity and nutrition. I would also like to measure their height, weight and waist size. The survey and measuring will take approximately 30 minutes and will take place during the school day at _____ School.

I would also like to interview parents and caregivers about their child's health. This interview will take approximately 30 minutes and can take place in your home or at the community health clinic.

Potential Harms, Risks or Discomforts:

Your child may experience some discomfort during the measurement of their height, weight and waist. They do not need to participate in any aspect of the measuring that makes them feel uncomfortable.

Potential Benefits

The benefits of this research will be at the community level where the results of this study can be used to increase awareness about healthy behaviours and to influence health policies and programs for Aboriginal children.

Payment or Reimbursement:

Student participants will receive a t-shirt to acknowledge their participation.

Confidentiality:

Anything that your child says or does during this interview will not be attributed to him/her personally. Anything that we find out about your child that could identify him/her will not be published or disclosed to anyone else without your permission. Your child's privacy will be respected.

The information that he/she shares will be summarized along with information obtained from other participants. Only the research team will have access to the data summaries. Individual survey responses will not be shared with the community partners nor with the funding organization. All measures of privacy, confidentiality and security will be respected. This includes keeping the information secured in a locked filing cabinet behind a locked door for a period of not more than five years.

The overall results of this study will be summarized in a report that will be presented to the participating First Nation communities. The results will also be prepared in the form of a dissertation to fulfill the requirements of a PhD program. Further, the results of this research will be submitted in the form of journal articles intended for publication following approval by the community partners.

Participation:

Your child's participation in this research project is voluntary. If they decide to participate, they do not have to answer any question that they don't want to. They can decide to stop at any time, even after signing the consent form or part-way through the survey or measurement. If they decide to stop participating part-way through the survey or measurement, there will be no consequence to him or her.

Information about this Study:

If you have any questions about this study or about being a participant, you can contact Lorrilee McGregor at (705) 285-4141 or if you prefer, you may also contact Nancy Young at (705) 675-1151 ext. 4014. Should you have any ethical concerns pertaining to the study, you can contact Jean Dragon, PhD at the Laurentian University Research Office at (705) 675-1151 ext. 3213.

Consent Form for My Child to Participate in a Study

- I have read the information presented in the information letter about this research project being conducted by Lorrilee McGregor, a student at Laurentian University.
- I agree to allow my child to participate in a survey about their diet, physical activity, sleep time, screen time, as well as language and culture.
- I agree to allow my child's height, weight, and waist circumference to be measured by the researcher.
- I have had the opportunity to ask questions about their involvement in this research project, and to receive any additional details I wanted to know about the research project.
- I understand that my child may withdraw from this research project at any time, if they choose to do so, without penalty.
- I have been given a copy of this consent form and the Letter of Information.

_____ _____

Name of Participant (please print) Signature of Parent/Guardian

Date:_____

Letter of Information for Parents/Guardians to Participate in a Focus Group

Research on Physical Activity and Nutrition among Aboriginal Children

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Community Partners: **Aundeck Omni Kaning, M'Chigeeng, Sagamok Anishnawbek, Sheguiandah, Sheshegwaning, and Whitefish River**

Aanii! Boozhoo!

I am a Ph.D. student at Laurentian University in the School of Rural and Northern Health conducting a research study to gain a better understanding of physical activity and nutrition among Aboriginal children.

Procedures involved in the Research

I would like to invite you to participate in a survey about your child's health. This interview will take approximately 20 minutes and can take place in your home or at the community health clinic. I would also like to invite you to participate in a focus group about community beliefs on physical activity and nutrition.

Potential Harms, Risks or Discomforts:

You may experience some discomfort with some of the questions asked during the survey or focus group. You do not need to participate in any aspect of this study that makes you feel uncomfortable.

Potential Benefits

The benefits of this research will be at the community level where the results of this study can be used to increase awareness about healthy behaviours and to influence health policies and programs for Aboriginal children.

Payment or Reimbursement:

Adult participants will receive a $25 gift card.

Confidentiality:

Anything that you say during the interview or focus group will not be attributed to you personally. Anything that we find out about you that could identify you will not be published or disclosed to anyone else without your permission. Your privacy will be respected.

The information that you share will be summarized along with information obtained from other participants. Only the research team will have access to the data summaries. Individual survey responses will not be shared with the community partners nor with the funding organization. All measures of privacy, confidentiality and security will be respected. This includes keeping the information secured in a locked filing cabinet behind a locked door for a period of not more than five years.

The overall results of this study will be summarized in a report that will be presented to the participating First Nation communities. The results will also be prepared in the form of a dissertation to fulfill the requirements of a PhD program. Further, the results of this research will be submitted in the form of journal articles intended for publication following approval by the community partners.

Participation:

Your participation in this study is voluntary. If you decide to participate, you do not have to answer any question that you don't want to. You can decide to stop at any time, even after signing the consent form or part-way through the survey or measurement. If you decide to stop participating part-way through the survey or focus group, there will be no consequence to you.

Information about this Study:

If you have any questions about this study or about being a participant, you can contact Lorrilee McGregor at (705) 285-4141 or if you prefer, you may also contact Nancy Young at (705) 675-1151 ext. 4014. Should you have any ethical concerns pertaining to the study, you can contact Jean Dragon, PhD at the Laurentian University Research Office at (705) 675-1151 ext. 3213.

Appendix B: Food Behaviour Questionnaire

Participation Agreement

Dr. Rhona Hanning and researchers from the Population Health Research Group at the University of Waterloo have designed this questionnaire to examine your food habits and those of other students your age. We want to know what sorts of foods you eat, how much physical activity you do, and your participation in language and cultural activities. We know that not everyone eats the same things or does the same things but we are very interested in your answers to the following questions.

The choice to participate in this survey is yours. The questionnaire takes about 30 minutes to complete. The questionnaire is strictly confidential. No one except the researcher Lorrilee McGregor and statisticians at the University of Waterloo will see your finished questionnaire so please answer as honest as you can. If there is a question that you don't know how to answer just raise your hand and ask Lorrilee for help. If don't want to answer a question, that's okay, just go on to the next one. You can also choose to stop doing the questionnaire at any time, by closing the internet window.

Miigwetch for helping us with this very valuable research!

Do you agree to participate in this survey?
□ No □ Yes

PARTICIPANT INFORMATION

1. How old are you? _____

2. What grade are you in? _____

3. Are you a boy or a girl? _____

4. What is your height? _____
   - Don't know

5. What is your weight? _____
   - Don't know

6. I would describe my height as:
   - Below average
   - Average
   - Above average

7. I would describe my weight as:

- Below average
- Average
- Above average

8. How often do you usually eat breakfast?

- Every day
- More than half the week (four or more days each week)
- Less than half the week (three or fewer days each week)
- On weekends only
- Rarely or never

9. Did anything prevent you from your normal eating patterns yesterday? (for example, sickness, trip, party)

- Yes
- No

10. How often do you participate in the school snack/breakfast program?

- Every school day
- More than half the week (three or more days each week)
- Less than half the week (two or fewer days each week)
- Rarely or never
- My school does not have a breakfast/snack program

11. At which times did you eat or drink anything yesterday?

- Breakfast
- Morning snack
- Lunch
- Middle of the afternoon snack
- After school snack
- Dinner/supper
- Early evening snack
- Later evening snack

12. How often do you eat or drink these foods?

	Several times a day	Once a day	A few times a week	About once a week	Rarely or never
Milk and milk products (yogurt, cheese)					
Salty snacks like chips or cheesies					
French fries or other fried potatoes					
Cola-type pop like Pepsi or					

Coke					
Non-cola type pop like 7UP or gingerale					
Fruit juice					
Pizza					
Sweets (candy, chocolate bars, cakes, cookies)					
Game (partridge, deer, moose or fish)					

13. How often do you eat meals or snacks prepared away from home?

	Once a day	2-5 times a week	Once a week	Once a month	Rarely or never
School cafeteria including special pizza days and other special meals					
Fast food restaurant or take out					
Other restaurants					
Vending machines					
Tuck shop/snack bar at school or an arena					
Convenience stores					
At a friend or relative's home					

14. We have found that people often have difficulty picking the correct type of beverage that they drink. Please move the beverage images into the box labelled with the correct category. (Leads to a Beverage Tutorial)

15. On your BREAKFAST plate select what you had for breakfast yesterday.

16. On your LUNCH plate select what you had for lunch yesterday.

17. On your DINNER/SUPPER plate select what you had for dinner/supper yesterday.

<u>Physical Activity in the Last 7 Days</u>

18. Have you done any of the following activities in the past 7 days (last week)? If yes, how many times?

	No	1-2 times	3-4 times	5-6 times	7 or more times
Skipping/ jumping rope					
Roller blading					
Active games (tag)					
Walking for exercise					
Bicycling					

Jogging or running					
Swimming					
Baseball/ softball					
Dance (social, recreational, traditional)					
Football					
Racquet sports					

19. Have you done any of the following activities in the past 7 days (last week)? If yes, how many times?

	No	1-2 times	3-4 times	5-6 times	7 or more times
Skateboarding					
Soccer					
Volleyball					
Hockey					
Basketball					
Ice skating					
Martial arts					
Gymnastics					
Lacrosse					
Other					

20. In the last 7 days, during your physical education (gym) classes, how often were you very active (playing hard, running, jumping, throwing)?

- I don't do physical education (gym)
- Hardly ever
- Sometimes
- Quite often
- Always

21. In the last 7 days, what did you do most of the time <u>at recess/nutrition break</u>?

- Sat down (talking, reading, doing school work)
- Stood around
- Walked around a little
- Ran around and played quite a bit
- Ran around and played hard most of time

22. <u>In the last 7 days</u>, on how many days <u>right after school</u>, did you spend playing or working outside?

O None
O 1 time last week
O 2 or 3 times last week
O 4 times last week
O 5 times last week
O Don't know

O Refused

23. In the last 7 days, on how many <u>evenings</u> did you play sports, dance or play games in which you were very active?

- None
- 1 time last week
- 2 or 3 times last week
- 4 or 5 times last week
- 6 or 7 times last week

24. <u>This past weekend</u>, how many times did you do sports, dance or play games in which you were very active?

- None
- 1 time
- 2 or 3 times
- 4 or 5 times
- 6 or 7 times

25. Which ONE of the following describes you best <u>for the last 7 days</u>? (Read all five statements before deciding on the one that describes you.)

- All or more of my free time was spent doing things involving little physical effort.
- I sometimes (1 or 2 times last week) did physical things in my free time.
- I often (3 or 4 times last week) did physical things in my free time.
- I quite often (5 or 6 times last week) did physical things in my free time.
- I very often (7+ times last week) did physical things in my free time.

26. In the last 7 days, about how much time on an average day were you physically active? (You were breathing hard and sweating a little?)

- Rarely
- 15 minutes a day
- 30 minutes a day
- 45 minutes a day
- 60 minutes or 1 hour a day
- 75 minutes or 1¼ hour a day
- 90 minutes or 1½ hour a day
- More than 90 minutes

27. Were you sick in the last 7 days, or did anything prevent you from your normal physical activities?

- Yes
- No

28. How many times in the last 7 days did you walk, bike or skate to and/or from school?

- None
- 1 time
- 2 times
- 3 times

- 4 times
- 5 times

29. If none, how much time <u>each day</u> do you spend riding the bus or getting a ride to school and back home? (*Total time per day*).

- None
- Less than 30 minutes
- 30 minutes to 1 hour
- 1 to 1½ hours
- 1½ to 2 hours
- 2 to 2 ½ hours
- 2 ½ to 3 hours a day
- 3 to 4 hours a day

30. Do you have a TV in your bedroom?

- Yes
- No

31. <u>Last weekend</u>, about how many hours <u>a day</u>, on average, did you spend: watching TV/movies, playing video/computer games, or on a computer or cell phone chatting, texting, emailing or surfing the internet? (*Total time per day*).

- None
- Less than 1 hour a day
- 1 to 2 hours a day
- 3 to 4 hours a day
- 5 to 6 hours a day
- 7 or more hours a day
- Not sure

32. In the last week <u>on a school day</u> about how many hours <u>a day</u>, on average, do you spend: watching TV/movies, playing video/computer games, or on a computer or cell phone chatting, texting, emailing or surfing the internet? (*Total time per day*).

- None
- Less than 1 hour a day
- 1 to 2 hours a day
- 3 to 4 hours a day
- 5 to 6 hours a day
- 7 or more hours a day
- Not sure

33. On WEEKNIGHTS I usually go to bed at ___ pm and wake up at ___ am.

34. On WEEKENDS I usually go to bed at ___ pm and wakes up at ___ am.

35. DIET AND HEALTH

	Definitely not	Not really	Neither	Kind of	Really
I am eating less than usual to try and lose weight					
I am eating more than usual to try and gain weight					
I am physically active					
I am a smoker					
I am concerned that my weight is too high					
I am concerned that my weight is too low					

Language & Culture

36. Which language(s) do you use most often in your daily life?

- English
- French
- Ojibway
- Other

37. Can you understand or speak Ojibway or another First Nations language?

- Yes
- No → (If no, go to question # 43)
- Don't know → (If don't know, go to question # 43)

38. How well can you understand and speak the language?

- **A few words**: understand or can speak a few words (aanii, baa maa pii)
- **Basic**: understand basic phrases, ask simple questions and write basic sentences
- **Intermediate**: understand main idea of everyday speech
- **Fluent**: no difficulty understanding spoken work, can read virtually any document, carry on complex conversations

39. How important is it to you to speak your First Nations language?

- Very important
- Somewhat important
- Not very important
- Not important at all
- Don't know

40. Do you take part in any of the following traditional cultural activities? (Check all the ones you have participated in.)

- Pow wows
- Dancing ie. shawl, grass

- o Drumming
- o Making regalia
- o Sweat lodges
- o Ceremonies
- o Feasts
- o Canning/preserving/smoking food
- o Seeking the advice or guidance of an Elder
- o Hunting
- o Fishing
- o Picking medicines
- o Picking berries
- o Gardening
- o Making maple syrup
- o None of these
- o Other:

41. Who helps you to understand your traditions and culture? (Check all that apply.)

O Grandparents
O Parents
O Aunts and uncles
O Other relatives (brothers, sisters, cousins)
O Friends
O School teachers
O Community elders
O Other community members
O No one
O Don't know
O Refused
O Other: _____

42. How important are traditional cultural activities in your life?

- o Very important
- o Somewhat important
- o Not very important
- o Not important at all
- o Don't know

Congratulations, you are done!
Thank you for taking the time to fill out this survey.

Appendix C: Procedures for Weighing and Measuring Height, Weight and Waist Circumference

Measurement of Standing Height[2]

Equipment

Health O Meter Professional

Model: 500 KL

Procedure

Before measuring height ensure that the scale/height board is on level ground. Check that shoes, socks and hair ornaments have been removed.

• Ask the child to stand on the baseboard with feet slightly apart. The back of the head, shoulder blades, buttocks, calves, and heels should all touch the vertical board.

• Ensure that the child's head so that a horizontal line from the ear canal to the lower border of the eye socket runs parallel to the base board.

• Pull down the headboard to rest firmly on top of the head and compress the hair.

• Read the measurement and record the child's height in centimetres to the last completed 0.1 cm in the Measurement Record Sheet.

[2] World Health Organization (n.d.). Training Course on Child Growth Assessment. WHO Child Growth Standards. (Online), retrieved on January 31, 2012 at http://www.who.int/childgrowth/training/jobaid_weighing_measuring.pdf

Measurement of Weight

Equipment

Health O Meter Professional

Model: 500 KL

Procedure

Before measuring height ensure that the scale/height board is on level ground. Check that shoes, socks and hair ornaments have been removed.

• Ask the child to stand on the baseboard with feet slightly apart.

• Read the measurement and record the child's height in kilograms to the nearest 0.1 kg in the Measurement Record Sheet.

Measurement of Waist Circumference[3]

Equipment

K-E Anthropometric tape or equivalent

Procedure

Clear the clients abdomen of all clothing and accessories. Position the client with feet shoulder width apart and arms crossed over the chest in a relaxed manner. Take a position to the right side of the client's body [while] on one knee.

- Using the NIH [National Institutes of Health] protocol, the waist circumference measurement should be taken at the top of the iliac crest. To find this landmark, palpate the upper right hipbone of the client until you locate the uppermost lateral border of the iliac crest. Draw a horizontal line at this landmark at the midline of the body.
- Position the tape directly around the abdomen so that the inferior edge of the tape is at the level of the landmarked point. Use a cross-handed technique to bring the zero line of the tape in line with the measuring aspect of the tape. Ensure that the measuring tape is positioned in a horizontal plane around the abdomen. Apply tension to the tape to ensure it is snug, without causing indentation to the skin. At the end of a normal expiration, take the measurement to the nearest 0.5 cm.

[3] McGuire, K.A. & Ross, R. (2008). The Revision of the Measurement of Waist Circumference in the CPAFLA. Canadian Society for Exercise Physiology. (Online), retrieved on January 31, 2012 at http://www.csep.ca/english/view.asp?x=724&id=84

Appendix D: Focus Group Questions for Parents/Caregivers

Objectives:

- to examine existing cultural beliefs and practices about food and physical activity in First Nation communities and how these beliefs and practices have changed over time

1. When you were growing up, how did families feed and raise healthy active children in your community? (Probes: How did people get their food? How available was it?)

2. What kinds of foods did families eat in the past? (Probe: What kind of traditional foods did your family eat?)

3. How has this changed over time? (Probes: Where do people get their food now? How accessible and available are traditional foods?)

4. Why do you think this has changed?

5. How have these changes in diet affected families and communities?

6. When you were growing up, how did children keep physically active? (Probe: What kinds of activities were children involved in? organized sports, playing outside, chores?)

7. How has this changed over time? (Probes: How physically active are children now compared to when you were young?)

8. Why do you think this has changed?

9. How have changes in physical activity affected families and communities?

10. What changes in homes and in the community are needed to help children eat healthier?

11. What changes in homes and in the community are needed to help children get more physically active?